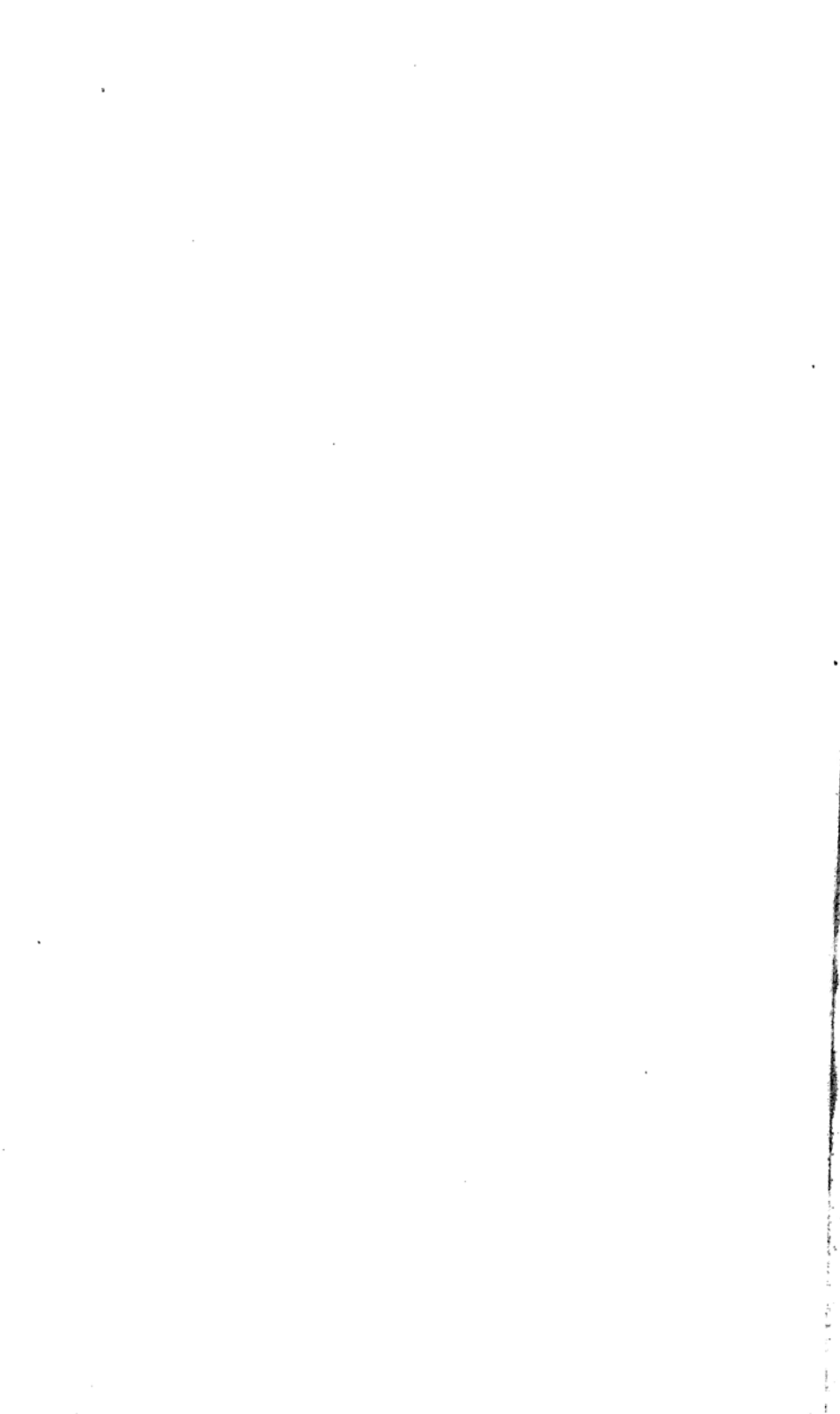


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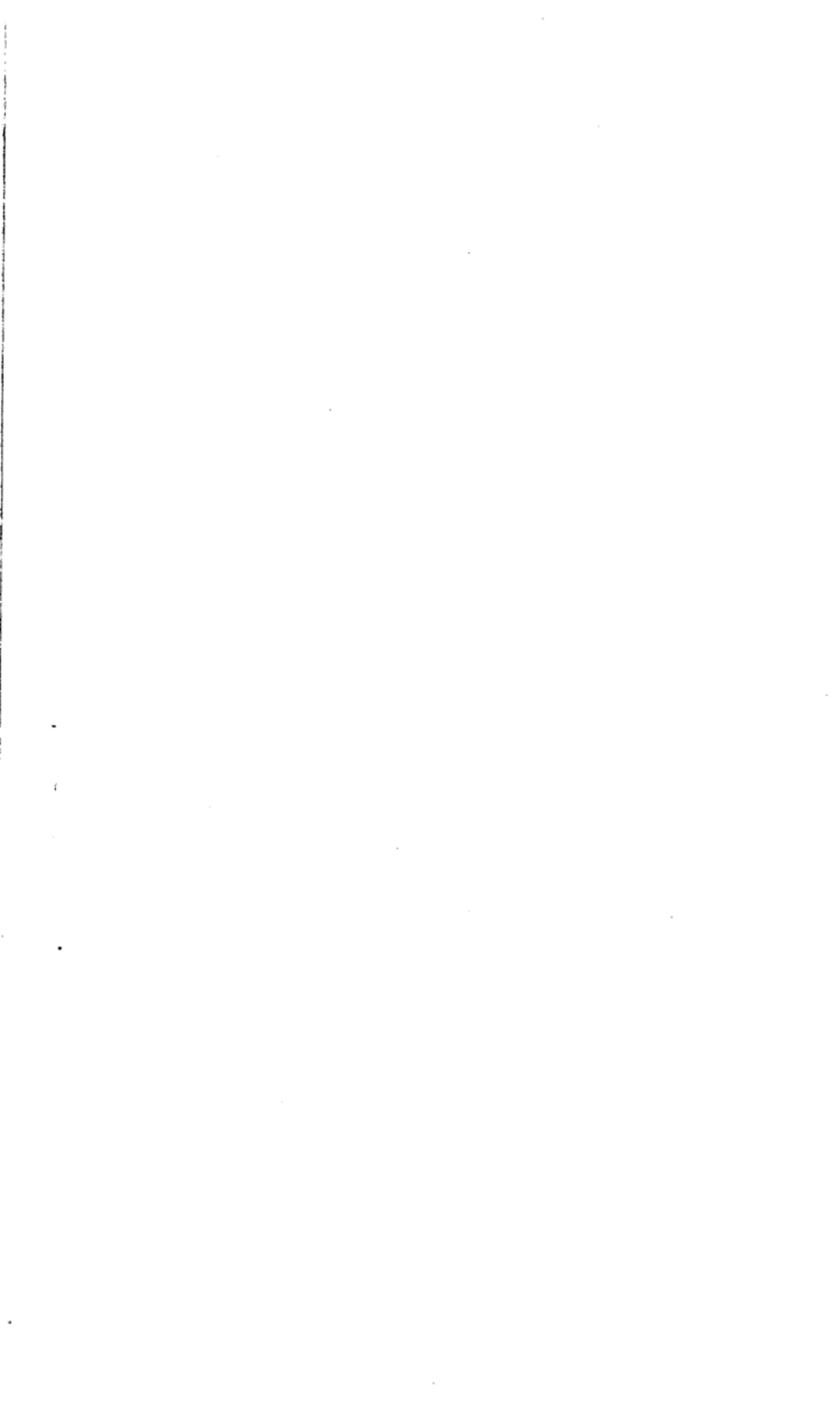


PLATE I



The Entrances to the Rock-shelter of Le Moustier and the Cave of Font de Gaume

TOOLS AND THE MAN

BY
W. B. WRIGHT

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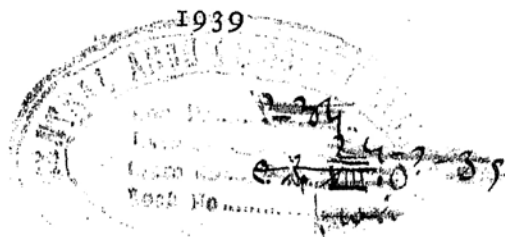
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'Man is a Tool-using Animal. Weak in himself, and of small stature, he stands on a basis, at most for the flattest-soled, of some half square foot, insecurely enough; has to straddle out his legs, lest the very wind supplant him. Feeblest of bipeds! Three quintals are a crushing load for him; the steer of the meadow tosses him aloft, like a waste rag. Nevertheless he can use Tools, can devise Tools: with these the granite mountain melts into light dust before him; seas are his smooth highway, winds and fire his unwearying steeds. Nowhere do you find him without Tools; without Tools he is nothing, with Tools he is all.'

CARLYLE: *Sartor Resartus*, Chap. IV.

PREFACE

IN the present volume an attempt is made to convey accurately and concisely some idea of what is known concerning man's development in the Stone Age, and the conditions under which it took place. For a proper appreciation of the picture, some knowledge of glacial geology and palaeontology is necessary. The bare essentials of these are sketched in two short chapters, calculated to give the minimum information necessary to the understanding of what follows. These, it is hoped, will inspire a desire for further reading.

With a view to incisiveness and realism, the subject is dealt with as much as possible in the form of actual descriptions of cave deposits and stratigraphical sites. These are selected from among those which have been studied with modern care and exactness, and thus all vague generalisation is avoided. This arrangement should be as satisfactory to the reader as it is to the writer, for, while it saves the latter from the risk of error, it assures the former of the essential soundness of what he is reading.

An assemblage of pure facts would, however, make a dull book, so the writer has speculated freely when occasion seemed to warrant it. The reader will have little difficulty in detecting when he is being led away on such flights of the imagination, and can tickle his fancy with them or skip them as he so desires.

The leading idea of the book is the application and illustration of Breuil's classification based on the Somme.

A fairly exhaustive examination of the latter in its relations to glacial correlation has convinced the writer that it is correct in its main points, and may be applied to the elucidation of other problems.

A word of explanation is called for in regard to the terminations adopted for such names as Aurignacian, Solutrean, etc. Professor Boswell has called for uniformity of treatment, but Mr. Burkitt, on the other hand, considers that Solutréen should not be Anglicised to Solutrian, since the original name is Solutré. I am inclined to agree with him and adopt Solutrean; also, with more hesitation, Chellean, out of respect for the silent termination of Chelles.

I have been asked to supply a table giving succession and correlation. I should much prefer the reader to make his own, as he reads. He will then know what it is based on and appreciate it at its true value.

W. B. WRIGHT

Manchester.

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CHAPTER I

INTRODUCTION

ONE would like to approach the study of early man by the historical method and depict the gradual growth of our knowledge of the subject. This is, however, too devious a method for a volume of the present size. We must ask the reader to take for granted the struggle of the pioneers and the prejudice and ignorance they fought against. As a result of their valiant efforts for the greater part of a century, we have now a wonderful accumulation of facts and a fairly rich harvest of illuminating ideas on their interpretation.

Early man has left his record in cave and surface deposits throughout Europe, Africa and Asia in the form of implements made from the various materials which came to his hand. No doubt only the more resistant are preserved to us. There can be little doubt that wood was in use at a very early date, yet we know very few cases of tools made from it. It has perished completely under the condition of preservation of most deposits of the Old Stone Age. Peat deposits, in which it is sometimes excellently preserved in strata of more recent date, were rare in Palaeolithic times. Bone is also distinctly perishable, and has been removed by solution from all archaeological deposits of any age which have lain long exposed on the surface or in an acid soil. Many of the sandhill sites of the Mesolithic are entirely devoid of it. The calcareous deposits of most caves lead, however, to its perfect preservation. Younger Palaeolithic man made extensive use of

it, fashioning it into shape with his harder implements of stone, and frequently embellishing it with admirable etching and carving. In Older Palaeolithic times its use was less frequent, although not entirely unknown, and this is not the result of destruction by the weather, for unworked animal bones are abundant in deposits of that date. Stone implements in general show much greater resistance to the processes of decay, and, since man naturally used the harder types, may, for the period of his existence on the earth, be regarded as quite indestructible. It was only in Postglacial times that he discovered the process of grinding into shape such tools as hammers and axes, so that the temptation to use a softer material did not exist. All earlier implements were made by flaking and chipping, and in this process hardness, and to some extent brittleness, were a distinct advantage. Fineness of grain leading to conchoidal fracture was the great desideratum. Flint was ever the ideal material, and Palaeolithic man lived and flourished where there were abundant supplies of it, thus showing his absolute dependence on the manufacture of tools.

Where a substitute can be found, it was freely employed in the absence of true flint. In many parts of Africa the glassy lava known as 'obsidian' has been widely used. It is almost as easily worked, but perhaps not quite so tough. Indeed any glass will do, and some of the natives of Africa have in recent years freely used bottle glass. Of artificial materials, porcelain is even preferable to glass, being less brittle, and at one time there was difficulty in keeping telegraph lines open in certain districts of Africa owing to the demand on the part of the natives for porcelain insulators. However, these were not available to early man, and he used mainly flint and obsidian. Quartz was sometimes employed, but its

irregular fracture made fashioning extremely difficult. Chert, a type of siliceous concretion not unlike flint, was also tried, but its fracture is unreliable and irregular. Occasionally the siliceous sandstone known as 'quartzite' has been brought into service. When the material varies, typology becomes difficult, owing to the changing response of the different rocks.

We thus have, on all occupation sites, and in many stratified deposits during the deposition of which man occupied the country, a series of well-preserved stone tools, which show definite characters according to the horizon from which they are derived. The stratification in the caves helps us to arrange them in order of development, and their occurrence in Quaternary deposits enables us to identify them with geological history. Typology is of little use without stratigraphy as its guide, and stratigraphy, in its turn, can only be really effective with the aid of typology. The following pages will endeavour to show how the sequence has been established, and, once established, how it can be used to correlate one geological event with another, and render the story of Quaternary Europe more intelligible than geology alone can make it. To an increasing extent also the study of primitive implements enables us to separate local development from the effects of invasion, and, in some instances, to trace the origin of an invading race. Progress has of recent years been so rapid as to leave no doubt in the mind that the course of man's early development and migration will ultimately become clear. Let us hope that that time will still leave us some problems to solve, and so preserve for us the charm and lure of the unknown.

CHAPTER II

A PALAEOLITHIC METROPOLIS

ON the margin of the Central massif of France, in the Dordogne, is a limestone country, very like our Derbyshire, consisting of a high plateau dissected by deep river valleys. The valley sides, like those of Derbyshire, are often quite precipitous, and the undercutting of the streams, combined with the wash of rain, has excavated many recesses in the cliffs. These, being more or less protected by an overhanging roof, have been utilised by prehistoric man as rock-shelters, and in the village of Les Eyzies itself some of the existing houses are half rock-shelters, the modern roof being firmly cemented on to the projecting crag, while the deeper caves are invariably used as stables. The cave of Crô-Magnon itself is such a stable, but is visited to-day by pilgrims from all parts of the world, anxious to stand upon the spot where the skeletons of this ancient Aurignacian race were first brought to light.

Here and there the cutting of the valley has left high and dry the course of some former subterranean water-course, which now opens on the valley side, and in the inner recesses of the tortuous cavern thus produced, perhaps a hundred yards from the mouth, where the light of day never penetrates, these Aurignacian men and their successors, the Magdalenians, have depicted with marvellous skill the objects of their chase, the bison, the horse, the mammoth and many other animals. For a few francs the visitor can examine all the most important of these wall-paintings and engravings, carefully illuminated by electric lights placed to the best advantage,

and picture how different were the conditions under which they were executed.

It was, however, in the shallow caves and rock-shelters (Fig. 1) that prehistoric man lived his daily life, ate his food and slept. These rock-shelters are scattered far and wide throughout the valley of the Vézère and its tributaries. The names that have been given to many of them are famous in the world of science: Crô-Magnon, Micoque, Le Moustier, Laugerie-Basse, Laugerie-Haute and La Madeleine. They mostly face south, no doubt on

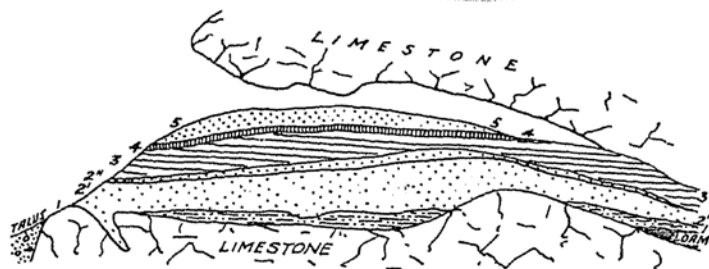


Fig. 1. Section of a Typical Rock-Shelter or Shallow Cave, Grotte du Trilobite, Yonne, E. France, excavated by the Abbé Parat. 1, Mousterian. 2', 2'', Aurignacian. 3, Solutrean. 4, Magdalenian. 5, Neolithic.

account of the extra dryness and heat obtained in such an aspect. Here there are thick deposits often built right up to the overhanging roof, or overlain and sealed down by debris fallen from it. In Laugerie-Haute one can see the great blocks which expelled the first Magdalenians and forced them or their descendants to seek shelter lower down the slope in Laugerie-Basse. These great rock falls were no doubt the result of earthquakes. They recurred at a subsequent date, and expelled the later Magdalenians from Laugerie-Basse, and even the much later Neolithic and Gallo-Roman people were not immune from such catastrophes.

The deposits beneath contain in stratified succession the debris of the various occupation levels. By taking

several caves (Fig. 2) we get a complete succession of the whole Palaeolithic period, from Pre-Chellean to Magdalenian. M. Peyrony, who has done most of the modern excavation of these sites, has left intact pillars of the original contents of the shelters as witness of the genuineness of his results, and alongside these are placed drawn sections explaining the significance of each layer.

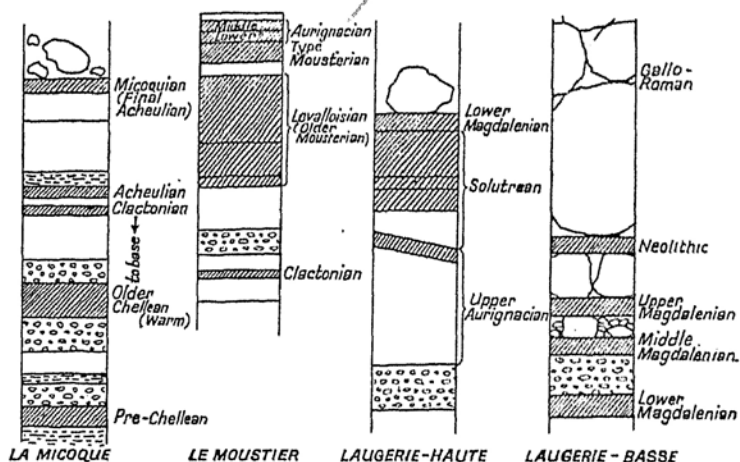


Fig. 2. Sections from the Caves of Les Eyzies (Dordogne) to demonstrate the French Archaeological Succession. (After Peyrony and Maury, with Breuil's interpretations)

We are thus introduced to the classification of the Palaeolithic. This is unfortunately at present in a state of flux and if one would read intelligently one must know both the old and the new. From the four sections given we can make out the following succession:

Magdalenian	{ III II I }	} Younger Palaeolithic
Solutrean		
Aurignacian	{ III II I }	

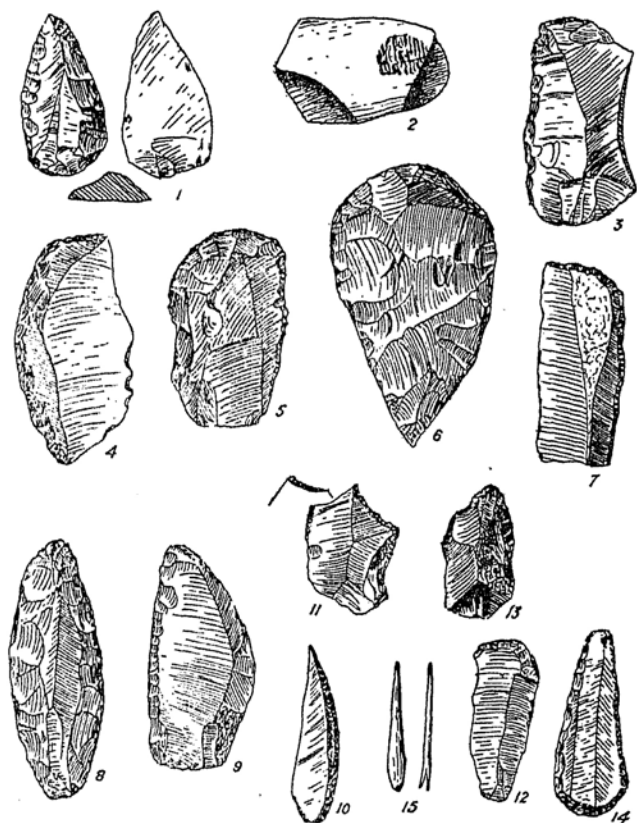


Fig. 3. Implements from Le Moustier. (After Peyrony: *Revue Anthropologique*, 1930, p. 48)

Figs. 1-9. Mousterian *Sensu lato*:

1. Small thick sub-triangular point, with retouched bulb, retouching on right more abrupt than on left.
2. Bone compressor.
3. Quadrangular racloir.
4. Racloir (rare).
5. Grattoir.
6. Coup-de-poing.
7. Knife, with blunted back.
8. Racloir, retouched on both edges.
9. Point, incurved to left.

Figs. 10-14. Aurignacian:

10. Chatelperron point.
11. Burin.
12. Grattoir, on blade end.
13. Grattoir, thick, keeled.
14. Grattoir on blade, retouched all round.
15. Bone point with split base.

Scale, $\frac{1}{4}$

Mousterian	}	Middle Palaeolithic
Acheulian		
Chellean		Older Palaeolithic
Pre-Chellean		

This is the first French classification which has grown out of that of the famous de Mortillet. Even though it is now being altered and superseded, it is current in all existing Palaeolithic and Quaternary literature, and it is essential to know it.

Pre-Chellean, Chellean and Acheulian are what are

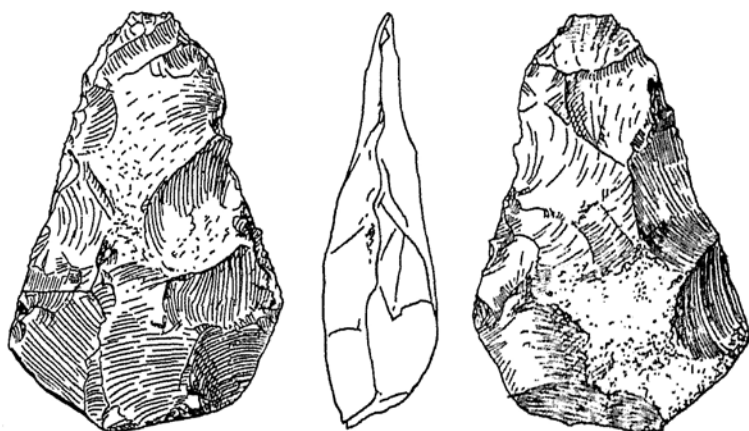


Fig. 4. *Coup-de-poing* from the Middle Gravels of the 100-ft. terrace of the Thames, Barnfield Pit. (Milton Street)

Scale, $\frac{1}{2}$

known as the *coup-de-poing*, hand-axe or biface cultures, the characteristic implement of which is a trimmed nodule or large flake worked on both sides into the shape shown in Fig. 4. No reasonable suggestion has ever been made regarding its use, but the first two names suggest the theory that it never had a handle, and the Abbé Breuil's term 'biface' merely refers to the fact that both sides are shaped by chipping. The Chellean was very rough and generally has some of the cortex of the

flint left at the base. The Acheulian was a highly perfected tool. The Chellean of de Mortillet was intermediate and not clearly separated from the Acheulian. Consequently, the Abbé Breuil has transferred the name 'Chellean' to the implements formerly called 'Pre-Chellean,' justifying himself on the grounds that the type locality Chelles only yields Acheulian forms *in situ*.

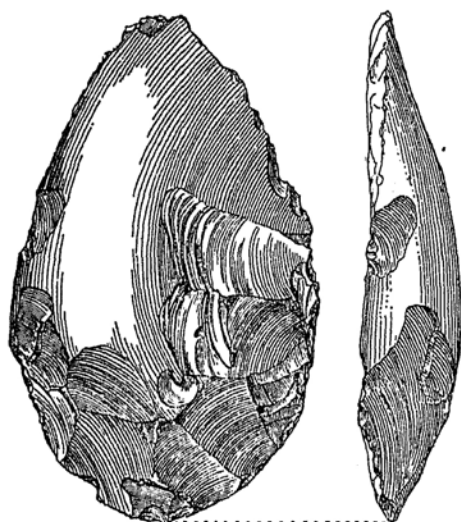


Fig. 5. Twisted Ovate from Warren Hill.
(After Solomon)

Scale, $\frac{1}{4}$

The type locality for truly Chellean forms is the high (45 m.) terrace at Abbeville, and Breuil suggests that for purists the term 'Abbevillian' should be substituted.

The Acheulian is a very long period, and its division by Breuil into seven sub-zones in the north of France has been effected mainly on stratigraphical grounds. This will be dealt with later. In the meantime it is important to note that fineness of work and diminishing size characterise the middle and upper sub-divisions, which are also marked by the incoming of the twisted ovate (Fig. 5).

As the function of the *coup-de-poing* is unknown the purpose of the twist can only be guessed. Possibly it is entirely unessential. The final Acheulian is sometimes termed 'Micoquian,' from the cave La Micoque, in which it forms the uppermost culture.

The Mousterian (*s.l.*) is essentially a flake culture. Its

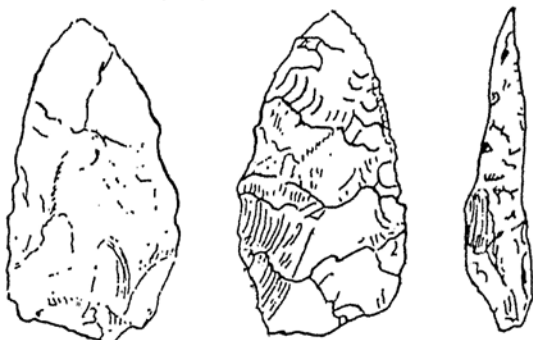


Fig. 6. Levallois Flake from Wolvercote, Oxford.

(After Sollas)

Scale, $\frac{1}{2}$

type locality is the cave of Le Moustier (Dordogne). Its characteristic implement is the Levallois flake (Fig. 6).



Fig. 7. Mousterian Point, Spy. (After M. de Puydt and Max Lohest)

A core of flint is trimmed into the shape of a tortoise (the so-called tortoise-core), and with a single blow the top is struck off, giving a flake having one rounded side with many partial flake scars and one flat side with a single flake scar and bulb of percussion. This technique is found throughout the cave of Le Moustier.

This seems a clear and simple transformation. With the transition from Older to Middle Palaeolithic the industry changes from the hand-axe to the flake. But, unfortunately, with the advance of research, flake tools

have come to be known from almost the whole Lower Palaeolithic. Breuil distinguishes three types:

- (3) Mousterian flakes proper, from the very uppermost layers of Le Moustier, below the Younger Palaeolithic or Aurignacian.
- (2) Levalloisian flakes from the north of France and rarely from the middle layers of Le Moustier.
- (1) Clactonian flakes, found in the lower Acheulian, or between the Chellean and Acheulian in La Micoque and at the base of Le Moustier.

The following distinctions are drawn: The Levallois flake proper has a carefully prepared or facettted striking platform for the reception of the powerful blow that separates it from the core and makes the flat side. The Clactonian has no such prepared platform. The Mousterian flake always shows secondary working on its edges, the Levallois rarely. The Mousterian flake tends to be triangular, the Levalloisian ovate.

The type locality of the Clactonian is Clacton in Essex, that of the Levalloisian is Levallois in France (now destroyed), that of the Mousterian the cave of Le Moustier (Dordogne). The Mousterian of the former glacial and a good deal of the archaeological literature, especially the Older Mousterian, may be Levalloisian or even in some instances Clactonian. Those who use the term in Breuil's restricted sense should for the present add the letters *s.s.* (*sensu stricto*).¹

We now come to the Aurignacian or lowest member of the Younger Palaeolithic. It was introduced into de

¹ The narrowing of the connotation of a term is one of the least justifiable of palaeontological expedients. Mousterian is recorded throughout Germany, the north of France and England. Very little of it is Mousterian in the restricted sense of the term. It is Levalloisian and Clactonian. The Mousterian (*s.s.*) is a local culture of central and southern France. Only the Abbé Breuil dare make such a change. *Le roi s'amuse*.

Mortillet's classification by Breuil, who first recognised its importance and demonstrated its proper place in the Palaeolithic of Europe. It is essentially a blade and

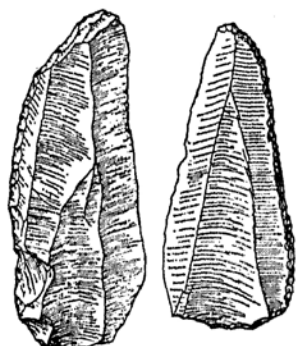


Fig. 8. Typical forms from the 'Abri Audi' characteristic of the final Mousterian.

(After Breuil)

Scale, $\frac{1}{2}$

burin culture. Long, more or less straight flakes are struck off an equally long prismatic core of flint and are fashioned into knives. The burin is a graving tool with a sharp point attained in various ways. Its use was apparently for piercing and also for engraving on bone or rock.

Now since the sub-divisions of the Aurignacian are shown in our Les Eyzies Caves it is fitting that we should characterise them without delay. First there is the Lower Aurignacian with curved points or blades, the Audi blade (Fig. 8) and the Chatelperron blade (Fig. 9, 1), themselves sufficiently distinct to form ground for a further subdivision. It will be noticed that the Audi culture shows some affinities with the Mousterian or Levalloisian—in fact, may form a sort of transition from it.

The Middle Aurignacian is characterised by keeled and nosed scrapers and notched blades (Fig. 10). These implements are

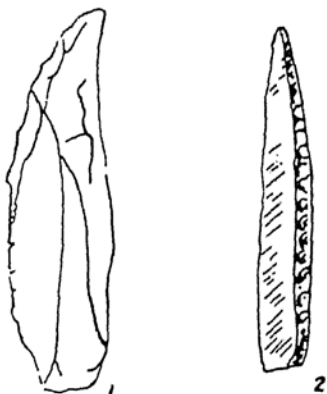


Fig. 9. Aurignacian Points, 1, Chatelperron. 2, La Gravette.

(After Déchelette)

Scale, $\frac{2}{3}$

regarded as sufficiently new to characterise the Middle Aurignacian as intrusive (Peyrony)—that is to say, not arising from the Lower by evolution, but appearing as if brought there by the temporary incoming of a distinct race of men. It will be noticed that the blades show secondary working along both edges as well as being sometimes notched. Keeled scrapers occur also in the Upper Aurignacian.

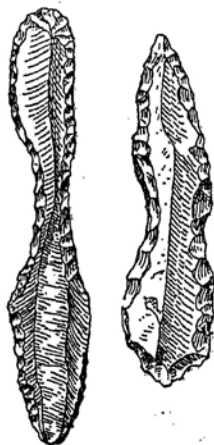


Fig. 10. Nosed Scraper and Notched Blade.

(After Déchelette)

The Upper Aurignacian reverts to the blade type of industry, but with this difference, that the blades are straight, the La Gravette type (Fig. 9, 2). There is a further stage of the Upper Aurignacian, the Font-Robert Stage, with the pedunculate or stemmed point (Fig. 11).

The whole is characterised by the use of bone for implement making, and art in the form of sculpture, painting and etching is fairly well developed. A characteristic implement of the Middle Aurignacian is the bone point with split base shown in



Fig. 11. Stemmed Points of the Type of Font-Robert. (After Breuil and Bouyssonie)

Scale, $\frac{1}{2}$

Fig. 12.

Then comes the definitely intrusive Solutrean (type locality Solutré, near Mâcon, Saône-et-Loire) with its beautiful laurel-leaf and shouldered points (or spear heads) (Fig. 13), the very climax of Palaeolithic flint working, only locally surpassed in later Neolithic times. This industry has been traced down the Danube to Hungary,

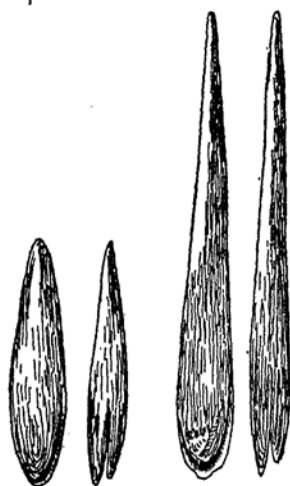


Fig. 12. Bone Points with Cleft Base belonging to the Middle Aurignacian.
(After Breuil) Scale, $\frac{1}{2}$

where it occupies a thicker belt of strata and is definitely associated with a race of peculiar character. It rather looks as if here we were nearer its source, and that it merely reached France as an invasion. There is a Lower or Proto-Solutrean, an early Solutrean and an Upper Solutrean, in the latter of which the beautiful ripple flaking reached its highest development.

Finally, at the summit of all is the Magdalenian, showing a definite decline in stone work but an increasing use of bone.

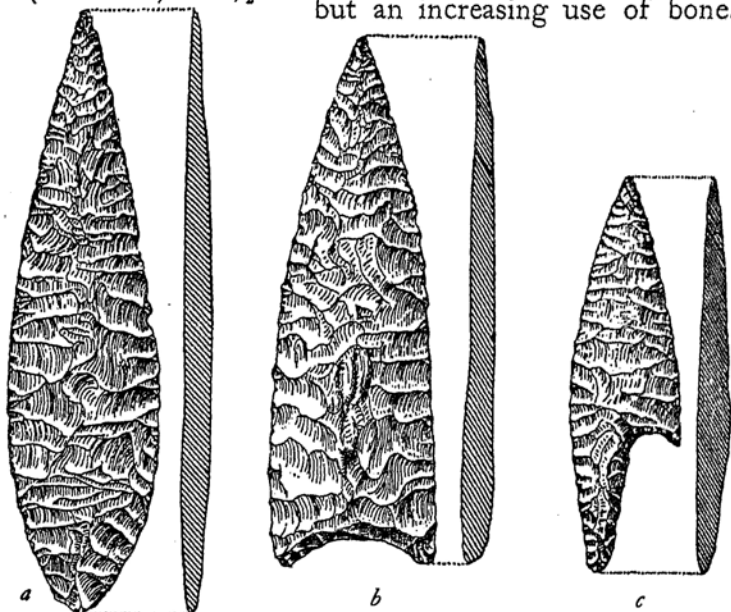


Fig. 13. Typical Forms of Solutrean Implements. *a*, Laurel-leaf point. *b*, Laurel-leaf point with concave base. *c*, Shouldered point.
(After Obermaier)

This is the great period of art both on the walls of the caves and their contents. Of this we shall give some account later. The burin or graver of flint becomes very important, and there are blades apparently notched for hafting and denticulate blades or saws (Fig. 31). Harpoons of reindeer horn are highly characteristic and

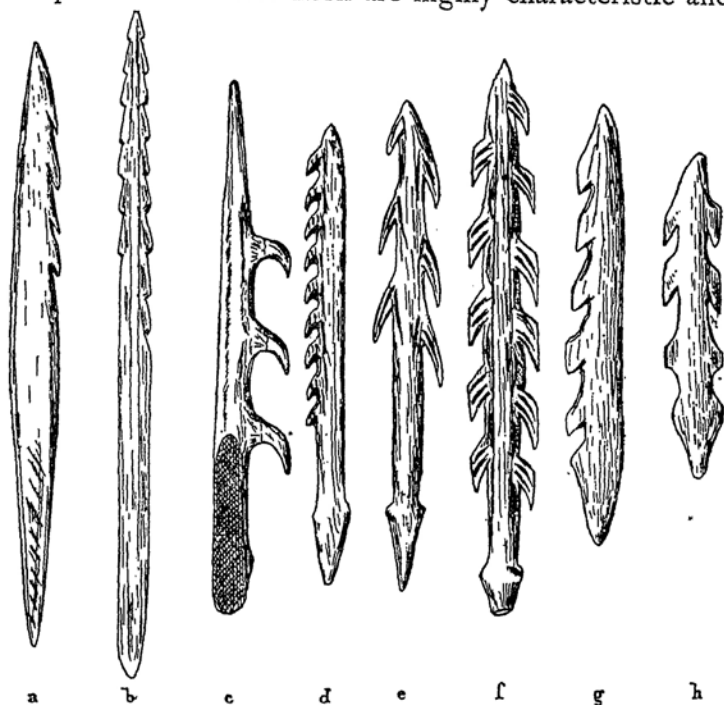


Fig. 14. Evolution of the Harpoon during Magdalenian Times. *a, b*, Archaic prototypes. *c, d*, Harpoons with a single row of barbs. *e, f*, Harpoons with a double row of barbs. *g, h*, Degenerate types of the final Magdalenian. (After Breuil)

show a regular evolution throughout the period (Fig. 14), those with two rows of barbs being the most advanced. The Magdalenian is divided into as many as six stages.

We have now passed in rapid review the industries of Les Eyzies. They are those of the Ice Age in its broadest sense, for the Chellean was in existence before the first

glaciation and the Magdalenian saw the close of the last. There was flint working before the Chellean and it continued after the Magdalenian. Of these Eolithic and Mesolithic industries we shall give some account later. In the meantime we must turn to glacial geology to gain some conception of the stage on which the Palaeolithic proper underwent its evolution.

CHAPTER III

BEFORE THE BEGINNING OF YEARS

WHEN we look back through what Peake and Fleure have so aptly termed the corridors of time we see the events of each age in lessened detail and on a dimmer background. Moreover, a mental aberration equivalent to foreshortening lessens the apparent interval between distant events. It is well, therefore, if we would appreciate the true relation of periods to one another, that we should have some adequate measuring stick to reach back into the past. Let us consider what is available to us as a first unit. The year is too short, the century too long. Few of us have experience of a century. We have a better appreciation of what we may call a generation—say, thirty-three years. With this in our minds, we can get an idea of historic times. Twenty-seven generations to the Norman Conquest. Fifty-eight to Christ. Seventy-five to Buddha, Confucius and Lao Tse. One hundred and forty-five to Sargon the First of the Sumerian Empire in Babylon. It seems all a matter of yesterday. We must go much further afield for the events which are dealt with in the present book. Our unit now is not big enough. Let us take thirty generations, or roughly 1,000 years. This is still quite a small and readily appreciable unit, since history teaches us what progress the world has made in it. Before we begin to use it beyond the ages covered by history, we must, however, consider what grounds are available to us once we lose the written record. We are in the domain of geology and archaeology.

Now, the most outstanding event in recent geological times was the Ice Age. If we could get some idea as to how long ago it ended we should have made an important advance. The Swiss geologist, Albrecht Heim, was the first to make an estimate of the kind. Where the River Reuss enters Lake Lucerne it has built what is called the 'Muota delta.' This has been formed since the withdrawal of the ice, and by estimating its total volume and

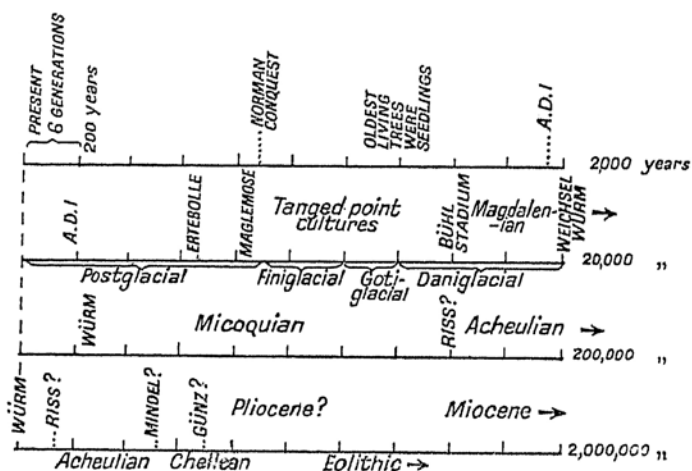


Fig. 15. Diagram to Illustrate the Comparative Length of the Historical and Geological Time Scales.

The scale of each line is $\frac{1}{10}$ of that preceding it

its growth in historic times, he found that it took approximately 16,000 years to build. This gives the date since the ice withdrew from the lake, i.e. since the Bühl stage of retreat. It would be a little longer to the last maximum. Penck thinks possibly 24,000 years. Magdalenian man, the last of the Palaeolithic hunters, was contemporaneous with the Bühlstadium. It gives us some conception of his age.

To the great Swedish geologist, Gerard de Geer, we owe, however, an even better reckoning of Postglacial

time. As Sweden was left bare in front of the retreating ice sheets of the North, its lower portions were covered by water, first the Baltic Ice Lakes, then the Yoldia Sea and finally the Ancylus Lake. The sediments laid down in these sheets of water by the inflowing glacial rivers were laminated or varved, each varve or lamina consisting of coarse sediment grading upwards into fine. The coarse sediment was laid down in the spring and summer when melting was in progress, and the finer in the winter, when refreezing checked the ablation. Each varve therefore represents a year and the varves can be counted. The counting, however, involves some beautiful technique, since the varves are not all in one section, and even if they were, the upper ones, being formed far from the mouths of the rivers, would be thin and difficult to discriminate. The lower ones are, however, fairly thick, and if these are measured it is found that they have each a fairly constant thickness from section to section, yet differ considerably one from another. Two sections can thus be correlated by tracing and comparing them, and in this way a continuous section can be constructed, giving all the varves formed in front of the ice during its retreat northward from the south of Sweden to where it disappeared into the mountains. In this way it is found that the ice-margin took about 2,000 years to retreat from the extreme south of Sweden to the Great Swedish Moraine (Gotiglacial, *see* Fig. 16) and 3,000 from the Moraines to Ragunda, where the last remnants of the ice-sheet split in two (Finiglacial). At Ragunda a fortunate circumstance enabled the count to be carried further into Postglacial time. Here a lake was catastrophically drained as a result of some engineering operations, and the stream cut sections through its sediments. The last of De Geer's varve series lay at the base, and could be correlated in the

usual fashion. Above them lay the whole series of sediments up to the present day all more or less varved,

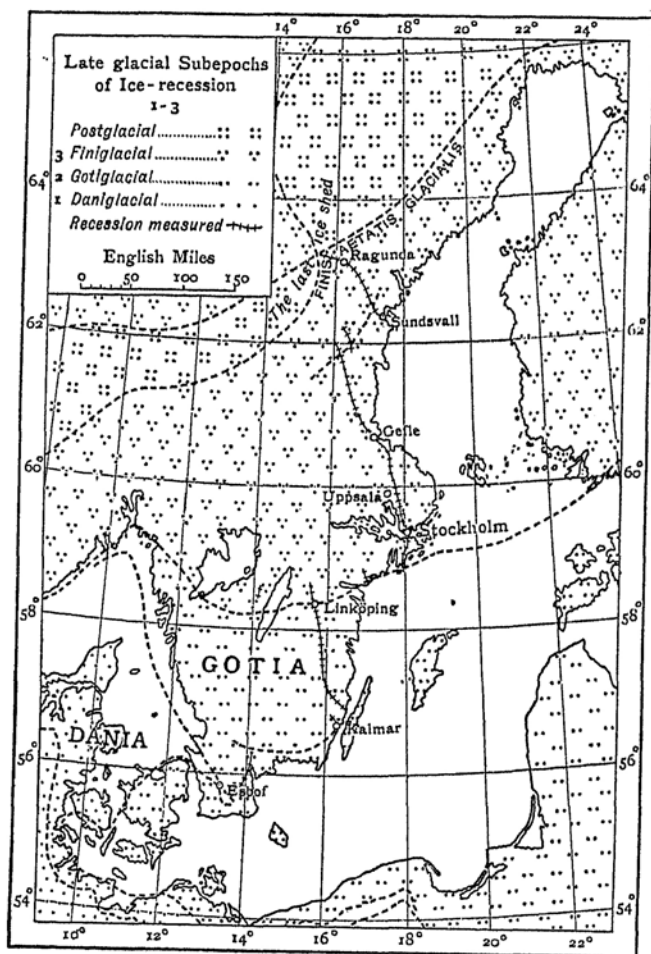


Fig. 16. Map of the Stages of Retreat in Denmark and Sweden.
 (After De Geer)

because of the melting of snows in the mountains and, with slight gaps, countable. These gave to the counts of de Geer and his wife and the subsequent counts of

Ahlman, Carzon and Sandgren the period of about 9,000 years for Postglacial time, thus:

Postglacial	..	..	..	..	9,000
Finiglacial	..	..	..	..	3,000
Gotiglacial	..	..	..	..	2,000
					<hr/>
					14,000 years

But this does not bring us to the beginning of the last retreat. Before the Gotiglacial was the Daniglacial, during which the ice retreated from the great Danish End-moraine, the outer margin of the Younger Drift, to the south of Sweden. Here there are no varves. The retreat apparently took place on land and we have to extrapolate. The gap is on the whole much wider than the Gotiglacial and the retreat was much slower. Shall we say 6,000 years, giving in all 20,000 years. We are now back before the end of the Magdalenian, for Magdalenian stations lie in Germany on the outer fringe of the Younger Drift.

On the whole, this estimate is quite comparable with that made by Heim, and we have a period of 20,000 years more or less—probably more—since the maximum of the last glaciation. Fifteen thousand years ago probably saw the last of the Magdalenians and, from that on, western Europe was occupied by men of varying cultures, Mesolithic, Proto-Neolithic, Neolithic, Bronze and Iron. This is the Postglacial period which botanists have divided on climatic grounds into—

Pre-boreal
Boreal
Atlantic
Sub-boreal
Sub-Atlantic

with a climatic optimum beginning at the end of the Boreal and extending through the Atlantic.

CHAPTER IV

THE SETTING OF THE STAGE

THE GLACIATION OF EUROPE AND THE BRITISH ISLES

THE claim of an eminent French geographer that maps of rainfall are maps of men is perhaps an overstatement of a partial truth, as its author no doubt realised, but it brings home to us very forcibly the importance of climatic control in human development and indeed in that of all life. Palaeolithic man, the succession of whose industries we have outlined in the previous chapters, played his part in a régime of climatic variation showing marked extremes of temperature and apparently also of humidity. It has been supposed that the variability of the conditions under which he lived proved a stimulus to his advance and led to his unparalleled success in the occupation of almost the whole of the habitable globe. It is very questionable, however, if a change so slow as to be unnoticeable in several generations could have such an effect, and it is chastening to think that the agricultural and pastoral civilisations of Europe have developed from their first beginnings in what may, after all, be only an Interglacial period.

Our task at present is to examine the geological record to see if we can outline a succession of climatic changes for even a limited portion of the world such as Europe, and correlate with this scheme the various industries. The extension of such a scheme to the world as a whole is a matter for the future.

THE ALPS. When a mountain glacier remains stationary at its maximum advance for a considerable period, the continual transport of material from beneath the ice to beyond its margin leaves a characteristic series of deposits readily recognisable upon its subsequent retreat. In the centre is a hollow, the tongue-basin, now commonly occupied by a lake; round this is the end-moraine, and beyond, extending indefinitely down the valley, is the outwash fan. By a study of the periphery of the Alps, Penck and Brückner recognised four such advances as marking the Pleistocene. Of these the latest has left a very clear and definite record, but the remains of the others are less well preserved. The fourfold nature of the glaciation is, however, clearly proved by the occurrence of four outwash fans, the remains of which are known as:

The Older Deckenschotter
The Younger Deckenschotter
The Higher Terrace
The Lower Terrace

The corresponding glaciations have been given territorial names, Günz, Mindel, Riss and Würm. A number of Interglacial deposits are known which serve to separate these from one another, and show by their fauna and flora that the glaciation of the mountains in the Interglacial periods was even less than at the present day. From the spacing of the terraced remains of the outwash fans, Penck has been able to estimate the relative amounts of erosion which took place in these Interglacial periods, and finds that of the three the central or Mindel-Riss period was much the longest. He thus gets the following climatic curve for the Alpine Quaternary, the curve indicating the displacement of the snowline.

Recent research has tended to modify this scheme but

slightly, and it may be taken as fundamentally correct. The transference of the nomenclature to other glacial regions should, however, not be attempted without sound grounds for correlation.

Penck's picture of the glacial and Interglacial climatic conditions at the foot of the Alps is rather important from an archaeological point of view. Plant remains, the best of climatic indicators, are almost entirely wanting in the outwash gravels, but some clays resting on the moraines of the last ice age yield a typical tundra flora at levels 600–800 m. below the Würm snowline. The similarity

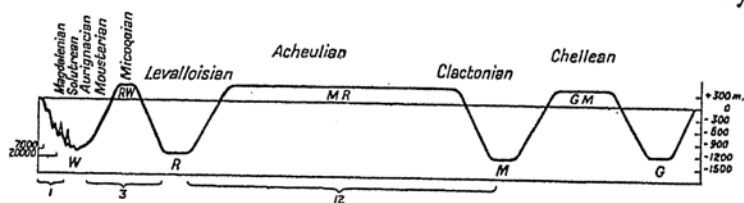


Fig. 17. Penck's Climatic Curve Showing the Depressions of Snowline for the Ice Age in the Alps. The archaeological periods are added from the latest evidence. The figures below indicate the estimated relative lengths of the Postglacial and Interglacial periods.

of the high Alpine and high northern floras of the present day and the fact that islands of both occur in the German Mittelgebirge, can only be explained by presuming a continuous expanse of tundra between the Alpine and Northern Ice. This means that the tree-line was depressed *pari passu* with the snowline during glaciation, and the big foreland glaciers ended in a tundra-like plain about 400–600 m. below the snowline. Braided streams continually shifting their courses distributed great gravel spreads over the country. Nevertheless, as on the margin of the Vatnajökull at the present day, the vegetation was sufficient to support animals, and there no doubt the mammoth and the woolly rhinoceros grazed.

Quite different were the conditions on the south side of

the Alps, where the greatly expanded glaciers must have extended into the forest belt as they do in Alaska at the present day. The reindeer and the woolly rhinoceros have never been found on this side of the Alps and the mammoth but rarely.

In striking contrast to the picture just drawn was the climatic régime during the Interglacial periods. The Baltic Forests extended to the northern foothills, the south belonged to the Illyrian botanical region, and plants of south-eastern ranges such as *Rhododendron ponticum* and *Buxus sempervirens* flourished up to 1,150 m. In the plains of Europe these must have been essentially forest periods, and Breuil pictures the Interglacial men, the Acheulians and Chelleans, as forest-dwellers, though it is hard to imagine their primitive hand-axes as being of much use in dealing with anything beyond fallen branches.

THE GLACIATION OF EUROPE. The glaciation of northern Europe presents a more difficult problem than that of the Alps. The great northern ice sheets were considerably more overwhelming and destructive in their advance than the smaller valley and piedmont glaciers of the south. The records of Interglacial periods are naturally preserved only in those places where deposition was dominant, and in such places they lie buried until revealed by natural erosion, mining or boring operations.

The extent of the ice at its maximum and the retreat stages of the better-studied area of North Germany are indicated in Fig. 18. The following succession has been deciphered but is not as yet completely understood:

Weichsel Stage	.	.	Brandenburg Moraine.
Warthe Stage	.	.	Fläming Moraine.
Saale Glaciation	.	.	Some scatterd end-moraines.
Elster Glaciation	.	.	Highly denuded.

fresher and has considerably more topographic expression than the Saale.

The Elster and Saale drifts have been most exhaustively studied in the neighbourhood of Leipzig, where excavations for Tertiary lignite led to their exposure. Here the following succession has been established by Grahmann:

		Loess, River Gravel.
Second Interglacial.		Erosion, weathering and decalcification.
Second or Saale Ice Age	Third Advance	{ Glacial sand. Ground moraine.
	Second or Main Advance	{ Glacial sand and laminated clay. Ground moraine. Laminated clay.
	First or Basal Advance	{ River gravel and glacial sands. Ground moraine. Laminated clay. River gravel (cold fauna).
First Interglacial.		Erosion, weathering and decalcification.
	First or Elster Ice Age	{ Glacial sand. Ground moraine. Laminated clay. River gravel.
		Erosion.
	Pre-glacial	{ Younger River gravel. Erosion. Older River gravel.

These sections clearly establish an Interglacial between the Elster and Saale Glaciations. A second is inferred from the weathering between the Saale and the loess, but although the loess is admitted to be glacial in origin, it is not known to which of the more northerly sheets, Weichsel or Warthe, it should be referred.

Within the area of the Weichsel Drift in the North German Plain numerous Interglacial deposits are known, and in some instances drift sections show two in superposition. There are thus at least two German Interglacial periods, but whether the older of these is that seen at Leipzig between the Elster and Saale Drifts is another matter. We have in the case of the latter no deposits and no fauna to help us, only denudation and weathering, phenomena which are in some cases seen in connection with the northern Interglacials.

THE GLACIATION OF GREAT BRITAIN. The independent glaciation of the British Isles has never been satisfactorily correlated with that of Europe and must be dealt with separately. Here, as elsewhere, we have Younger and Older Drifts readily distinguishable from one another by their degrees of denudation and topographic expression. The Older Drifts are only known in the south and are much denuded. The line I, Fig. 19, gives their approximate southern boundary. The lines II and III show roughly the limits of the Younger and Youngest Drifts. Only the latter are comparable in freshness of topography with the Weichsel Drift of Germany. The succession is as follows:

- | | |
|--|---------------|
| (5) Youngest Drift of Scotland and Western Ireland. | } ? the same. |
| (4) Hesse Glaciation or Younger Drift of the North of England. | |
| (3) Little Eastern or Upper Chalky of East Anglia. | |
| (2) Great Eastern or Great Chalky Boulder Clay. | |
| (1) North Sea or Scandinavian Glaciation. | |

The first episode was the invasion of the east coast of England from Durham to Suffolk by ice from the North Sea bearing Scandinavian erratics. The drifts of this stage have a partially water-laid appearance, and it is

supposed that the glaciers ended in water, possibly the sea, but more probably water that was ponded between

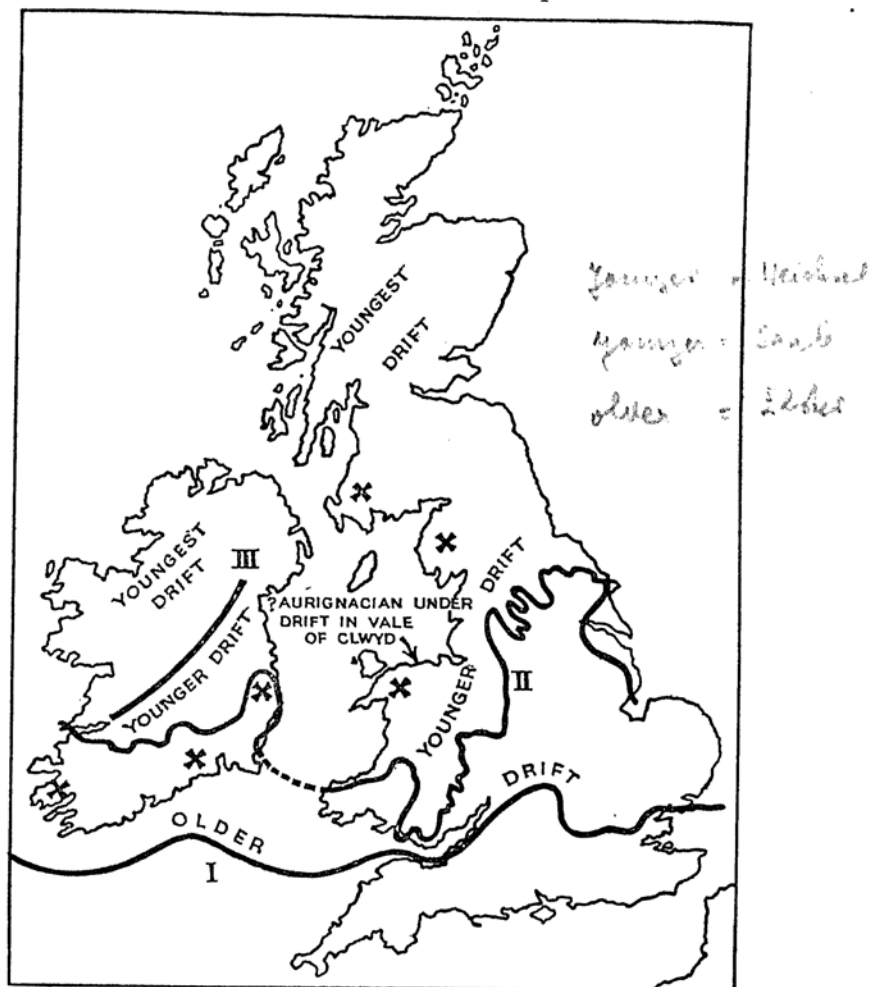


Fig. 19. Map showing the Approximate Limits of the Various Glaciations of the British Isles. The crosses mark outlying mountain-areas which have lake-bearing drifts equivalent to III. I, Older Drift. II, Younger Drift. III, Youngest (lake-bearing) Drift.

the advancing ice and the land at a time when the Straits of Dover were not yet open.

These drifts are entirely decalcified and were, according to Boswell and others, deeply denuded before the succeeding glaciation laid down the Great Chalky Boulder Clay. The Great Eastern Ice which deposited the latter came south along the east of England between the land on one hand and the still present North Sea Ice on the other. It deployed from the Fen district at the head of the Wash in a great fan to the east, south and west, its limits having been admirably traced by Harmer and Wood, so that its boulder clay constitutes, in the glacial deposits of England, a concise and well-defined unit.

The Little Eastern Glaciation is much less well defined. Its boulder clay, the upper chalky, is only known in a few places in East Anglia, and in this district it is mainly responsible for a series of outwash gravels, the cannon-shot gravels, which have a wide distribution. It is supposed also to be responsible for the periglacial solifluxion (for explanation, *see* p. 31) of Norfolk and Suffolk. Now, on consulting the diagram (Fig. 19) it will be noted that the line II which limits the Younger Drift stops short at the Wash. Charlesworth has continued it along the Cromer Ridge, and considers it to be Magdalenian in age. The present writer has never had enough confidence to do this, nor does he think it is the limit of the Magdalenian Glaciation. This Magdalenian Glaciation in Germany is the Weichsel, a very much fresher drift sheet than our Younger Drift. The latter has no undrained hollows or unsilted lakes such as abound in the north of Germany. To find these in the British Isles, we must go to Scotland, Wales or western Ireland—that is to say, on to the Youngest Drift. It is this latter, and not what has hitherto been called our 'Younger Drift,' that we must equate with the Younger Drift or Weichsel Glaciation of Germany. A very partial

and hypothetical line III is shown in Fig. 19 to indicate where this drift occurs.

As for our Younger Drift of northern England, it is probably, as explained in Chapter XII, really Older Drift in the Continental sense. It has a character in common with the Saale Drift of Germany that makes it rather likely that they are of the same age and reflect the same climatic oscillations. Both are tripartite, with three boulder clays and two middle sands. The Younger Drift of England has, moreover, all the appearance of having suffered considerably from a type of denudation which is quite distinct from what has occurred in Post-glacial times, is accompanied by much soil-creep and softening down of the slopes, and, though showing none of the solifluxion features which characterised its own periglacial regions, its topography is most easily explained as the result of prolonged subsequent denudation in a glacial climate.

The phenomenon of solifluxion to which reference has been made several times in the last few paragraphs is becoming a most important one in archaeology, for it is the mark which glaciation leaves in the periglacial regions. It was first described by Martin Conway in Spitzbergen and may be briefly described as soil-creep in a glacial climate. Repeated freezing, thawing and admixture with snow render the soil mobile, so that it moves on quite gentle slopes—as low as 2 degrees—and thus becomes responsible for such appearance as contortion of bedding and verticality of pebbles. It is quite common in the south of England and northern France, both on the Older Drifts and beyond their margin. It produces stony clays or pseudo-boulder clays in places where there has been no glaciation, but such clays may mark the occurrence of a glaciation not very far to the north and

thus provide a useful index-bed in archaeological stratigraphy. It is held to be responsible for the 'Coombe-rock' and 'Trail' of the south of England.

It might seem conducive to clearness to give here a correlation table of the Alpine, European and English drifts. Glacialists are not however as yet in a position to do this. They need, like all other geologists, in order to make a correlation, the aid of zone fossils, in this case mainly the implements of man, and as it is with these that the present volume is principally concerned, the matter is best deferred to a later chapter.

CHAPTER V

THE MAMMALS OF THE QUATERNARY

IN the unravelling of the complicated chronology of the Quaternary, the study of faunas has yielded evidence of inestimable value. In the old days much careless digging of caverns and collecting from gravel pits gave rise to the idea that at that period the cold-loving and warmth-loving animals lived side by side and the cause of the mingling of the north and south was an outstanding question. With time it became obvious that there was no such problem, that the warm and cold forms were not really mixed, and that the fossils could be used to give a very fair idea of the conditions under which any deposit was laid down.

Take, for instance, the hippopotamus and its almost unfailing attendant, the little shell *Corbicula fluminalis*. These inhabit at the present day the rivers of warm temperate and sub-tropical regions of the Old World, and their presence in northern Europe indicates almost certainly a climate somewhat warmer than the present. On the other hand, the presence of Arctic animals such as the musk ox or the reindeer shows with almost equal certainty sub-glacial conditions. There is even a third element which intrudes itself into our Quaternary world, namely the steppe fauna of the dry plains of the east, of which we may cite as examples the saiga antelope and the jerboa. Here we have a real mixing, for the steppe animals lived alongside the cold animals of the north, indicating that unusual geographical anomaly, a cold steppe. The

steppes of our present-day world lie in the main to the south of the taiga or belt of coniferous forest which extends across Asia from Atlantic to Pacific. Opinion seems to differ as to whether the forest belt can fail and bring into proximity the tundra and steppe faunas. Mixing undoubtedly takes place along the slopes of north and southwardly directed ranges, but this is hardly analogous to the Quaternary mixing in the plains of Europe. The steppes of the present day appear to be in the main warm, while those which fringed the ice-sheets of Europe were undoubtedly cold. The problem for solution is why there should have been steppes in such a situation at all. The answer is probably to be found in the anticyclonic winds which blew off the ice-sheet and took on an east-to-west component derived from the earth's motion. Such winds would bring the dry air from Central Asia over the plains of Europe and produce steppe conditions even in a cold climate.

The main elements that make up the Quaternary fauna of Europe are enumerated below, both living and extinct. The character, warm or cold, of the extinct fauna are deduced from their association with forms still living:

Southern or Warm Fauna.

Elephas meridionalis, the southern elephant.

E. antiquus, the straight-tusked elephant.

E. trogontherii.

Rhinoceros merckii, Merck's rhinoceros.

R. etruscus.

R. hemitoechus.

Hippopotamus.

Northern or Cold Fauna.

Elephas primigenius, the mammoth.

Rhinoceros tichorhinus or *Tichorhinus antiquitatis*, the woolly rhinoceros.

Ovibos moschatus, the musk ox.

Rangifer tarandus, the reindeer.

Myodes torquatus and *obensis*, the banded and Siberian lemmings.

Steppe Fauna.

<i>Alactaga jaculus</i> , or jerboa	} Rodents.
<i>Spermophilus</i> spp., or susliks	
<i>Arctomys bobac</i> , or steppe marmot	
<i>Lagomys pusillus</i> , or pika	
<i>Antelope saiga</i> , or saiga antelope.	
<i>Equus hemionus</i> , or asiatic wild ass.	
<i>E. caballus</i> , or horse.	

The carnivores are not included in the above list, as their distribution depends largely on food supply.

The classification of the Quaternary elephants is of considerable interest to archaeologists, since their evolution, their partiality to warm or cold climates, and their gradual extinction confer on them zonal or chronological characteristics of especial value. *E. meridionalis*, the largest and most markedly southern form, characterises the Pliocene. The forms of the Forest Bed, which occurs beneath the glacial drift of East Anglia, used to be referred to this species, but are, according to Pohlig (1909), rather *E. trogontherii*, which is intermediate between *E. meridionalis* and *E. antiquus*. The chronological value of these forms may be indicated. *E. antiquus* is the typical form of the Interglacial deposits of Europe. It has been separated into an archaic and a recent form. Pontier makes two intermediate forms, *E. trogontherii* and *E. intermedius*, the latter being in the line of ancestry of the mammoth. His placing in the sequence is as follows:

Pliocene: *E. meridionalis*.

Early Interglacial: *E. trogontherii*; *E. antiquus*, archaic form.

Late Interglacial: *E. antiquus*, late form.

Glacial: *E. primigenius* (and ? *E. intermedius*); and *E. primigenius*, Siberian form (very late).

The remains of these elephants which are most abundant are the teeth, which are distinguished from one another by the complexity of their enamel. The teeth of *E. meridionalis*, *E. antiquus* and *E. primigenius* have increasing complexity of enamel.

The Siberian form of *E. primigenius* associated in Europe with the Late Magdalenian shows an even greater complexity of the enamel than the normal form.

The dwarf elephants of the Quaternary of the Mediterranean islands, Sicily, Malta, Cyprus, Crete and Sardinia, the knowledge of which we owe largely to Miss Bates, are, according to Vaufray (1929), all races of *E. antiquus*, which occurs in the islands in three forms of decreasing size, *E. mnaidriensis*, *E. melitensis* and *E. falconeri*. Their arrival seems to imply connection with the mainland at some period of the Ice Age. They became extinct before the Younger Palaeolithic.

The classification of the rhinoceroses is less clear than that of the elephants, but, fortunately for the sciences of geology and archaeology, there seems to be no doubt about the separation of the cold-climate form, *R. tichorhinus* (*Tichorhinus antiquitatis*), from the warm climate forms, known as *R. merckii* (*R. etruscus*), *R. megarhinus* and *R. hemitoechus*. *R. tichorhinus* is allied to the modern African rhinoceros, while the remaining species form a group showing affinities to the Sumatran form.

CHAPTER VI

THE OLDER PALAEOLITHIC OF EUROPE

WE have given in Chapter II De Mortillet's classification of the Palaeolithic. This has stood for many years and been of the greatest service to geology and archaeology. It is still necessary to know it if we are to understand much of the past and even current literature, but all is now profoundly altered. It was inevitable that this should be so, and we can but congratulate ourselves that a master-hand was employed in its remodelling. Besides, in the study of solifluxion, the Abbé Breuil seems to have found the clue to Quaternary correlation, long sought by geologists, and if we object, as we are bound to do, to a drastic changing of the connotation of terms, we must remember that we do not argue with the surgeon, but rather thank heaven for his skill.

Even the very best of zonal schemes show a tendency with increase of knowledge to break down both laterally and vertically, to fail both in space and time. Time brings evolution and evolution is gradual; space brings changing conditions and different organisms. Evolutionary zones have indefinite margins and pass gradually one into the other, but, on the other hand, they rarely if ever show a recurrence of the same forms on different levels. Zones of immigration show sharper lower boundaries, but of necessity great lateral change. All zones are more or less local in their application, but the geologist must trust them; he has no other time scale. If they are

leading him astray, he will not be long in discovering it, for anomalies will soon present themselves.

Now, of the classification of the Palaeolithic into Lower, Middle and Upper, the Upper still stands, but the distinctive industries of the Lower and Middle, the *coup-de-poing* and the flake, have been abundantly proved to run parallel to one another in time and even to intermix. Of the discoveries which have contributed to this proof, we may mention those of Hazzeldine Warren, Reid Moir, Dewey, Smith and Peyrony, all leading up to the splendid generalisation of Breuil, which we shall now proceed to expound.

Breuil, in the first place, divides the Older Palaeolithic industries into flake industries and biface industries. These in France replace one another mutually several times and end by fusing. His classification is as follows:

Flake Industries

Ipswichian
Clactonian
Levalloisian
Mousterian

Biface Industries

Chellean or Abbevillian
Acheulian
Micoquian

Of these the flake tools tend to be associated with cold or glacial climates and the biface industries with warm or Interglacial climates. The rhythm of alternation may fail north-east or south-west. The following are the characters of the flake industries:

Ipswichian. Flakes of small size, with irregular retouch, hardly systematic, striking platform irregular and variable.

Clactonian. Flakes often large, also medium and small, worked on a stone anvil after removal of a first flake, the face left by which serves as a striking platform. The striking platform is large and makes an obtuse angle with the plane of fracture. The retouch towards the end of this industry is very beautiful and seems to demand a striker of wood.

Levalloisian. Derived probably by evolution from the Clactonian (among others by the intermediary of the Belgian Mesvinien). The nucleus is reduced by great blows to a discoid or rectangular

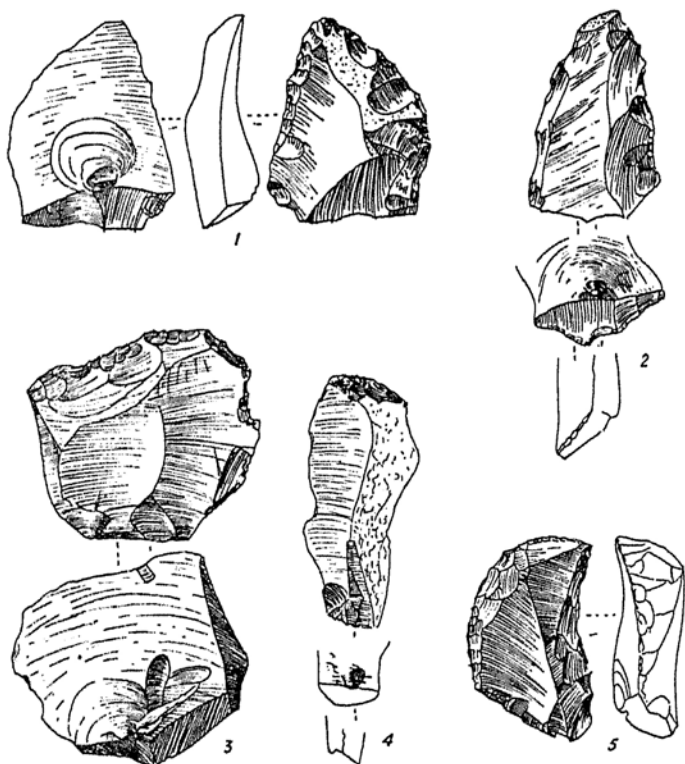


Fig. 20. Clactonian Implements from the Type Locality Clacton-on-Sea. (After Breuil). 1. Fairly thick point, inclination of striking platform about 130 degrees. 2. Triangular-pointed flake, angle of flaking, 137 degrees; large and prominent cone. 3. Pentagonal flake, well retouched on the dorsal face; usage fractures on the right edge. 4. Massive blade; angle, 132 degrees, cutting edge on left. 5. Point-scraper (racloir); striking platform at 140 degrees.

Scale, $\frac{1}{8}$

form; a striking platform is formed by retouching, and the flake is then struck off. The striking platform is not oblique.

The flakes struck off in fashioning the core are done on an anvil and may be ovoid, triangular or blade-like; only in the later stages are they retouched.

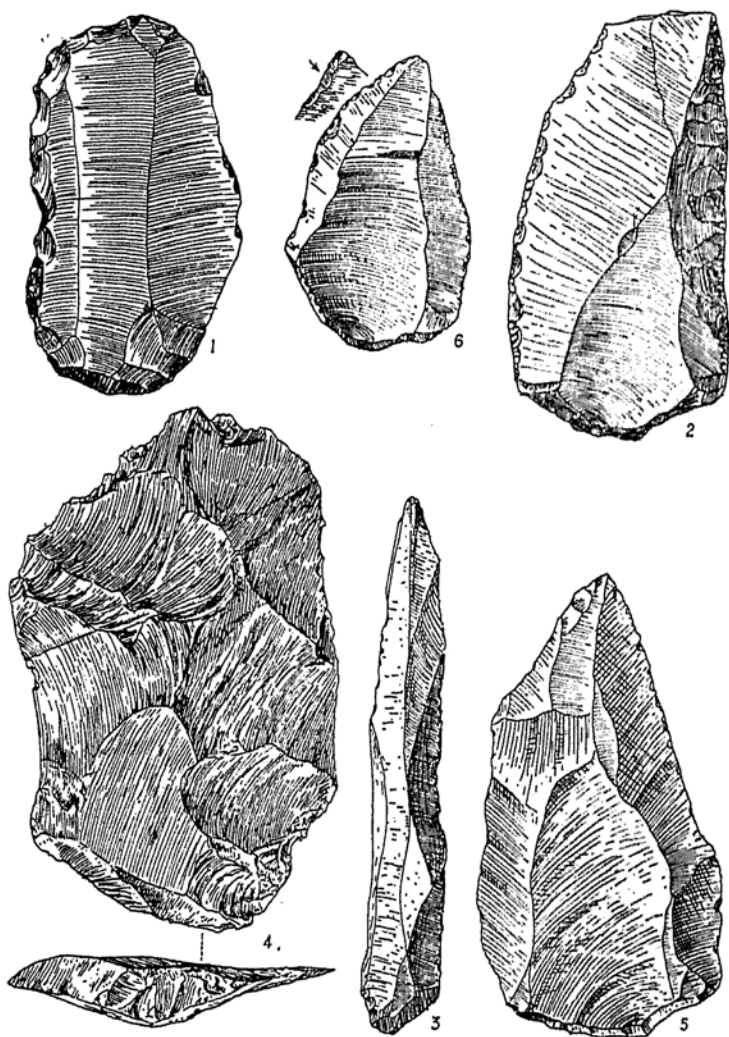


Fig. 21. Levalloisian Flakes from the 10-m. Terrace of the Somme. (1 after Breuil and Koslowski; the rest after Commont). 1. Levallois I. Solifluxion gravel of the 10-m. terrace, Montières-Etouvy (Thick flake). The fracturing of the edge is due to solifluxion. 2 and 3. Levallois IV. Boutmy-Muchembled, Montières. 4. Levallois V. Beauval (Thin flake). 5. Levallois VI-VII. Upper Levalloisian flake from a pebble bed in the upper loam (ergeron) of St. Acheul. 6. Levallois VI-VII. Triangular flake from Marlus (Oise).

Scale, $\frac{1}{4}$

Mousterian. This industry is not derived from the Levalloisian, but from the Clactonian directly in Perigord.

Below the Micoquian level at La Micoque are numerous levels of flakes, at first exclusively Clactonian, but higher up showing numerous flakes with preparation of the striking platform. Retouched flakes are also very numerous. This industry of transition might be called *Tayacian* (Peyrony). It is very abundant in Combe Capelle (H. Ami) below the true Mousterian of Acheulian tradition. It is characterised by flakes ordinarily smaller than those of the Levalloisian, but much retouched into points, scrapers (*racloirs*), etc. According to the level and the nature of the flint, the breaking up pursues the Clactonian tradition or the Levalloisian tradition (preparation of striking platform by facetting).

For example whilst in the Upper Mousterian of Le Moustier, preparation of the striking platform by facets is general, in that of La Quina it is quite exceptional. (In La Quina the material employed is much more voluminous.) Towards the end of the Levalloisian the two industries are contemporaneous and react on one another, having, however, different geographical distributions.

In the Middle Levalloisian and the Mousterian the flakes are freely mingled with bifaces.

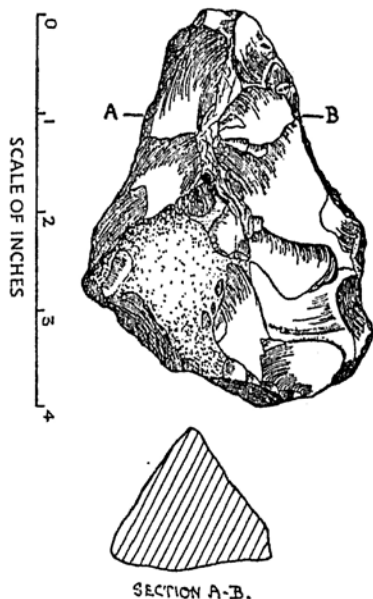


Fig. 22. Early Chellean Hand-axe from the Cromer Forest Bed, Cromer. (*Royal Anthropological Institute*) Scale, $\frac{1}{2}$

Alternating with these flake industries are the following biface industries:

Chellean (Abbevillian, the base of Chelles being Upper Acheulian).

Characterised by massive tools worked on both faces, generally on an anvil of stone, although the wooden striker intervenes also at the end. There are also retouched flakes, but they are small and unsystematic.

Acheulian. Certainly the descendant of the Chellean, but the working, or, at least, the retouching of the implements, is usually done with a wooden striker, the workmanship being much more perfect. The striking platforms of the flakes, unprepared and produced often on the anvil, are much less obtuse in the angle than those of the Clactonian (presumably this refers to the large flakes of which the implements are mainly

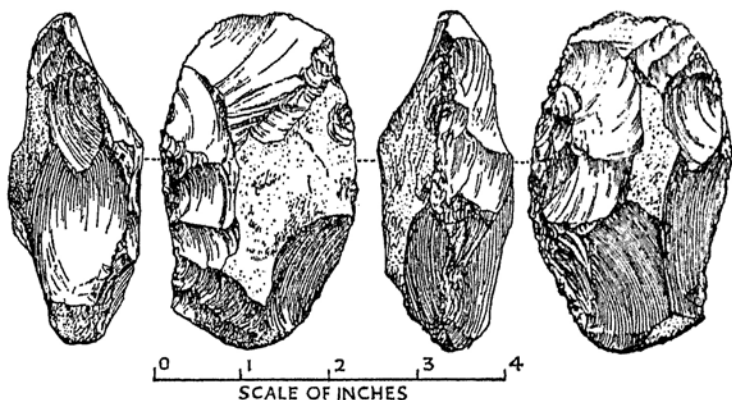


Fig. 23. Flint Implement of Early Palaeolithic-Chellean Type found by Mr. Sainty in the Lower Glacial Clay, Sidestrand, Norfolk.
(After Reid Moir)

fashioned). Numerous flakes are retouched into tools, often very perfect.

Micoquian. A dwarfed substitute for the Acheulian, of very delicate workmanship, associated with numerous flake implements, points, racloirs, etc. The bifaces are *lanceolate*.

There is pronounced mixing in the case of the Micoquian with the Middle Levalloisian or Older Mousterian (Tayacian) and a later mixing of *coups-de-poing* with evolved Levalloisian or Mousterian proper according to region, giving with these last the Coombe Capelle type of industry with cordiform and triangular bifaces.

The flake industries appear in France on the approach of the

glaciations and continue after them into the succeeding Interglacial periods. In terms of Breuil's correlation with the Alps:

The Ipswichian precedes the Günz.

The Clactonian appears at the end of the Günz-Mindel (first Interglacial) and occupies the beginning of the Mindel-Riss.

The Levalloisian appears at the end of the Mindel-Riss and

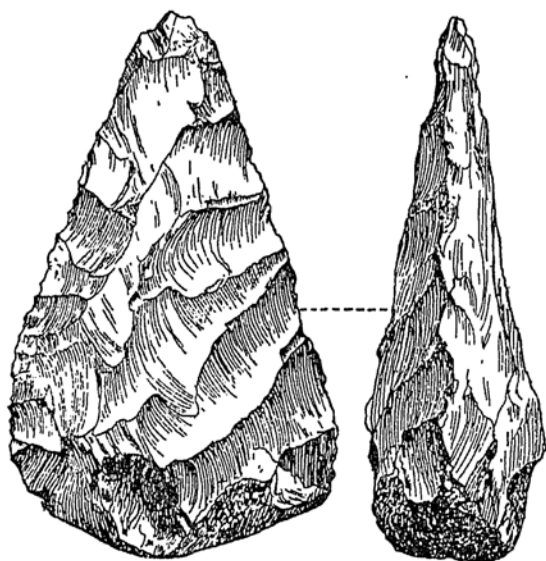


Fig. 24. Acheulian Hand-axe from Foxhall Road, Ipswich.
(*Royal Anthropological Institute*)

Scale, $\frac{3}{4}$

continues with interference and mingling with the Micoquian through the Riss-Würm up to the middle of the Würm.

The Mousterian appears in Central Europe before the Würm and develops to beyond its maximum.

On the contrary, the biface industries are strictly localised in the Interglacials, the Chellean in the Günz-Mindel, the Acheulian in the Mindel-Riss and the Micoquian in the Riss-Würm.

Everything takes place as if two populations, one northern and eastern making flake tools, the other

southern and Mediterranean with the *coup-de-poing*, had migrated with the climatic changes to which Europe was subjected. The northern group were pushed south with the growth of the glaciers, and only retreated north again under pressure from the southerners, when the ice released their former habitat.

The people with *coups-de-poing* followed closely the migration of the warm or temperate fauna.

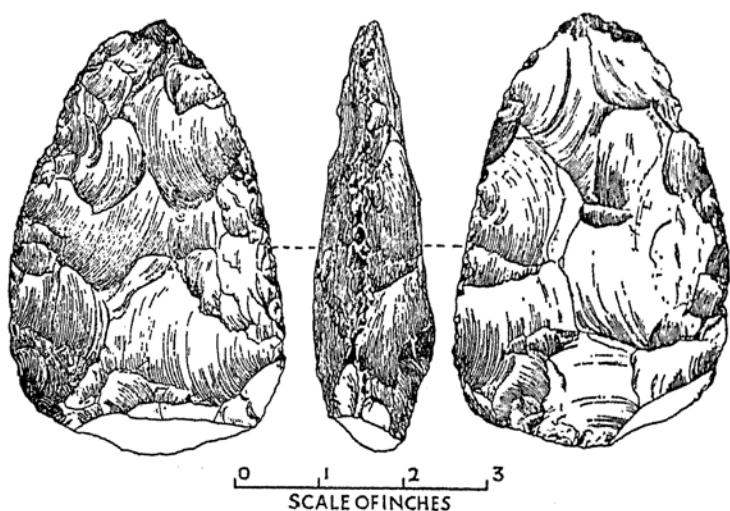


Fig. 25. Ovate Hand-axe of Acheulian Age found in Glacial Gravel at West Runton, Norfolk. (After Reid Moir)

As regards correlations with fauna:

The Chelleans or Abbevillians arrived with the last of the southern elephants (*Elephas meridionalis*), the archaic type of *Elephas antiquus*, *Rhinoceros etruscus*, *Machairodus*, *Hippopotamus major*, etc., and their remains are found in the 45-m. terrace of the Somme.

The Acheulians had no longer this fauna of Pliocene affinities, but still a warm fauna (30-m. terrace, etc.).

The Micoquians hunted the last *Elephas antiquus*, the last *Hippopotamus* and almost the last *R. merckii*. The

latter survived in south-west France up to the Older Mousterian and at Santander in North Spain up to the evolved Middle Aurignacian.

It will be seen, on examining the above classification of industries, that the flake tools of the different epochs are much more clearly distinguished from one another than the bifaces. Thus the Ipswichian is clearly without definite plan in the flake, while in the Clactonian the ultimate shape of one side of the flake is roughed out on the core before it is struck off. This in itself is a very great advance in technique. In the Levalloisian this technique persists, but there is, in addition, definite preparation, by flaking, of the striking platform and a nearly perpendicular instead of an oblique blow is used to separate the flake. The Levalloisian plane of separation is thus nearly at right angles to the striking platform, of which portion is preserved at the base of many flakes. The Clactonian plane of separation is markedly oblique to the simple striking platform. The use of a wooden 'hammer' for secondary retouching comes in at the end of the Clactonian. The Mousterian seems largely to be distinguished by the perfection of its technique and especially by its retouch. According to Breuil, it did not arise from the Levalloisian, but from a Clactonian matrix, as seen in Le Moustier, the Levalloisian technique of the prepared striking platform being only observable on a minority of the flakes on the lower levels of this shelter. This transitional industry of the south of France between the Clactonian and the Mousterian (*s.s.*) Breuil proposes to call Tayacian. It evolved contemporaneously with the advanced Levalloisian of the north of France, England and Germany, and the two industries reacted upon and influenced one another.

The Acheulian has been divided by Breuil into seven

stages (Acheulian I–VII of Chap. X). This subdivision, however, is not done entirely on typology, but has a stratigraphical basis. According to Alice Bowler Kelley, it is only possible to distinguish three or perhaps four stages by their character. These are:

Lower Acheulian (Breuil's I and II and Commont's *Chelléen*).

A core and flake industry in which anvil technique was employed in the first instance for primary flaking of the cores and for obtaining the large flakes from which the bifaces were made. The coarse bulbs of these flakes can often be seen at the base of the implement. All secondary flaking was done with wood or bone, which absorbed part of the vibration from the blow and produced long, flat flake scars with diffuse bulbs, thus leading to a straight cutting edge.

Middle Acheulian (Breuil's III and IV and Commont's *Chelléen évolué*) shows a great advance in technique. The ovates are thin and regular, often revealing an 'S' curve in the outline of their edges (twisted ovate). The core pieces are also very finely worked, with delicate elongate points, but usually a fairly heavy butt.

Upper Acheulian (Breuil's V and VI) differs little from Middle Acheulian, being mainly finer and more evolved, and in its upper portion (VI) shows some thin elongated forms with straight edges finely and alternately retouched on opposite faces. This latter technique also characterises Acheulian VII (Micoquian).

CHAPTER VII

THE YOUNGER PALAEOLITHIC

THE Younger Palaeolithic, though it occupies but a few thousand years out of the hundreds of thousands during which man made his implements mainly of stone, is nevertheless fairly complex. If time was shorter, progress and invention were more rapid, and migration probably easier. On the other hand, there was only slight change of climate and little aid is obtained from the study of fauna. Modern man made his appearance in Western Europe during the growth or first maximum of the last (or Würm) Ice Age and remained in the Palaeolithic stage of culture until after the waning of the second maximum. The type localities for the various stages are, as in the case of the Older Palaeolithic, mainly in France. We got a first survey of these in the caves of Les Eyzies (Chap. II) and need only recapitulate them here in greater detail:

(3) Magdalenian. Stages I-VI.

(2) Solutrean { Upper
 Middle
 Lower

(1) Aurignacian { Upper { Font-Robert Stage
 La Gravette Stage
 Middle (distinct from Upper and Lower)
 Lower { Chatelperron Stage
 Audi Stage

Of these the Middle Aurignacian and Solutrean represent a complete break in the type of industry and clearly mark invasions. The other sub-divisions, Lower and Upper Aurignacian and Magdalenian, probably represent an evolutionary sequence being developed one from the other, though Breuil thinks the Magdalenian represents the incoming of a new people. Peyrony, moreover, has found in the sequence of Laugerie Haute an industry of blades with blunted backs which he claims to be transitional between the Lower and Upper Aurignacian. In the absence from Laugerie Haute of the Middle Aurignacian, he considers that the natives continued their development in that shelter, while the invaders¹ occupied the neighbouring Gorge d'Enfer. He compares it with a similar industry in Bos del Ser in the Corrèze and with the upper Chatelperron level of La Ferrassie.

Younger Palaeolithic man occupied north-western Europe, as remarked above, during the various stages of the last Ice Age, and hunted the cold and indifferent animals only, the mammoth (*E. primigenius*), the woolly rhinoceros (*R. tichorhinus*), the horse, ox, bison, stag and giant deer, with the carnivores, bear, lion and hyaena. The reindeer also contributed to his food, but only became really abundant in the Magdalenian. The simple blades and blade-shaped tools are common to all

¹ In this connection, Peyrony suggests a change of nomenclature, proposing to restrict the term 'Aurignacian' to the industry of the Gorge d'Enfer and Cromagnon, marked by keeled scrapers, nosed scrapers, beaked burins and by the split-base bone point or '*pointe d'Aurignac*,' and to refer to the rest of what has been called 'Aurignacian' as Perigordian. Unfortunately, the deposits of Aurignac are now destroyed, so that the type locality is gone. The change will, however, be adopted if found convenient, and during the transition we can if necessary use the notations *s.l.* and *s.s.* (see glossary), to denote more exactly what we mean. Thus Middle Aurignacian = Aurignacian *s.s.* or, alternatively Aurignacian (Peyrony).

phases, but other tools are more characteristic of certain periods. The hand-points and scrapers of the Mousterian continue on into the Early Aurignacian, but the Audi and Chatelperron curved blades (Fig. 8 and 9, 1) are characteristic of the latter, the Audi point being reminiscent of the Levallois flake in its general shape. Since the change of industry was accompanied by a complete change of race, the affinity of the Audi culture to the Mousterian and Levalloisian is remarkable.

The Middle Aurignacian is very distinctive with its keeled and nosed scrapers and blades of various shapes,

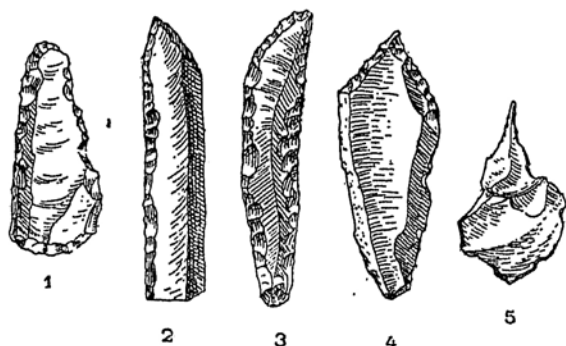


Fig. 26. Middle Aurignacian Blades and Points (After Déchelette)

backed on both edges or backed on one and retouched on the other (Fig. 26), blades with a notch, and many graters, some with curved points. The first bone-points with cleft or split base (Fig. 12) come in on this level. The base of the point is definitely split, not cut out, with two meeting grooves one from either side, as in later periods. This is the *pointe d'Aurignac*.

The Late Aurignacian derives its character as an industry both from the Early and Middle Aurignacian. There are keeled and nosed scrapers from the latter, and points of the straight, La Gravette type (Fig. 9, 2), backed along one edge. These are sometimes retouched on both

sides at the base, thus becoming slightly pedunculate and forming a sort of transition to the typical pedunculate Font-Robert point (Fig. 11).

The Solutrean presents a great contrast to the Aurignacian, on which it follows. It is essentially what the Abbé Breuil would call a 'biface' industry, the typical instruments being various types of spear points, beautifully fashioned with long pressure flaking extending over both sides. This pressure flaking is quite different from the Aurignacian marginal retouch, which is probably effected by a series of slight blows or taps. The laurel-leaf (bay-leaf or willow-leaf) points are characteristic (Fig. 13), but there are also points with a concave base and shouldered points. The type locality is the rock-shelter of Solutré, near Mâcon, Saône-et-Loire. Three stages have been separated: (1) Proto-Solutrean, (2) Early Solutrean, and (3) Late Solutrean. The Proto-Solutrean is an eastern development, being very slightly if at all represented in France. Thanks to the researches of Hillebrand in Hungary, there can be little doubt that the Solutrean technique developed in that country and only reached France as an invasion. Hillebrand has excavated six caves, all of which yielded Proto-Solutrean as follows:

<i>Szeleta.</i>	<i>Keskevely.</i>	<i>Palfy.</i>	<i>Jankovitch.</i>	<i>Puskaporos.</i>	<i>Balla.</i>
Typical			Typical	Typical	
Solutrean.			Solutrean.	Solutrean.	
Primitive	Primitive	Primitive	Primitive	Primitive	Primitive
Solutrean.	Solutrean.	Solutrean.	Solutrean.	Solutrean.	Solutrean.
		Typical			
		Aurignacian.			

In one of these, Palfy, the Proto-Solutrean was underlain by typical Aurignacian; and in three, Szeleta, Jankovitch and Puskaporos, it was overlain by Early Solutrean. The Proto-Solutrean laurel-leaf was a much coarser tool

than its successor, with only incipient or partial pressure flaking and a fair amount of percussion flaking. The flaking often extends over one side only, producing the Solutrean leaf-point. The climax of skill is found in the Early Solutrean, the masterpieces of this period being the laurel-leaf points, which vary in length from an inch or two to as much as a foot, and are beautifully worked on both sides. In the Late Solutrean the sides tend to be constricted at the base to form a sort of tang, usually unilateral, as if in imitation of the late Aurignacian shouldered point, but fashioned by pressure flaking instead of percussion. This is a characteristic French development of the Solutrean.

There can be little doubt that the Solutreans developed in Hungary, and came west along the valley of the Danube as a successful invading race with the superior armament of the lance point. They crossed over the head waters of the Rhine into central France, where for a time they appear to have locally dominated the indigenous Aurignacian population. Like all the conquerors of history, however, they seem to have been ultimately absorbed into the life of the conquered, for their technique ultimately disappeared, the stonework of the later Magdalenian being if anything a degenerate Aurignacian.

The distribution of the Solutrean industry in Europe is much more limited than that of the Aurignacian. It is restricted to the belt along the Danube above-mentioned, to central France, south England and the coastal belts of northern and eastern Spain. The latter area is the only point at which it touches the Mediterranean. It is completely absent in Italy.

The Magdalenians of France, who followed upon the Solutreans or, in those areas not occupied by the latter,

upon the Late Aurignacians, were a highly cultured race who developed to an advanced degree the use of bone



Fig. 27.
Magdalenian
Forked-base
Points.
(After Breuil)

tools. They decorated these and the walls of their caves with life-like engravings and paintings, which frequently show great powers of observation and a naturalistic realism of execution. The industry in stone is, however, poorly developed and lacking in skill, compared to that of either of their predecessors. The sub-division into six stages is effected by means of the bone and horn tools. The early stages, I to III, have no harpoons, only smooth lance points. These at first are massive, with a broad base generally finished with a simple bevel. Later come well-rounded forms with alternatively a rounded base or simple bevel, ending up in short small forms (Obermaier,

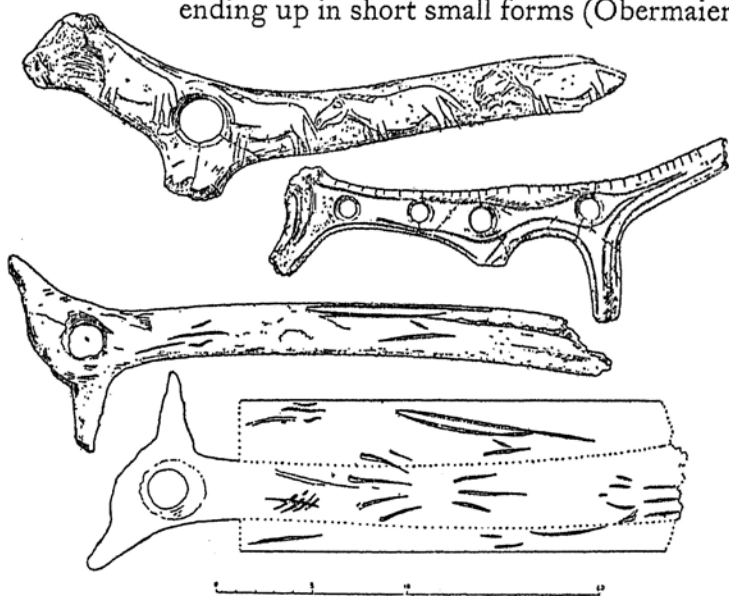


Fig. 28. *Bâtons-de-commandement* of Reindeer Horn. (After Déchelette)

1924, p. 107). Others have a forked base, the fork being produced by cutting two grooves, one down each side of the lance point, which meet in the middle (Fig. 27). The use of these arrangements for hafting is obvious. In early Magdalenian times the sides of the notch are almost parallel; later they become more divergent (Burkitt, 1933). These forked lance points are quite distinct from the split-base lance points of the Middle Aurignacian, the same end being attained in quite a different way. The later stages, IV-VI, yield harpoons of reindeer antler. Stage IV has primitive or archaic types with notched margins on one or two sides. In Stage V comes the harpoon with a single row of well-developed barbs, and in Stage VI that with two rows. With the disappearance of the Magdalenian come degenerate types, both single and double barbed, flat and approximating to those of the later Azilian.

In the Early Magdalenian the flint implements are quite primitive, resembling a poor Late Aurignacian industry, but later rather elegant blades, parrot-beaked gravers, scrapers and notched and denticulate blades and microliths are added to the inventory. The bone industry is much more varied. Important as mechanical devices are the spear- or dart-throwers (Fig. 29), and the pierced antlers (*bâtons-de-commandement*) supposed to be used as arrow straighteners (Fig. 28).



Fig. 29. Spear-Thrower, Mas d'Azil, Ariège. (After Déchelette)

The Magdalenians were reindeer-hunters *par excellence*. Their distribution was roughly the same as that of the Solutreans, but Obermaier is of opinion that their spread took place from the French Pyrenees, and was mainly eastward, and Breuil considers that the change in culture was due to the appearance of new peoples. There was apparently more tribal isolation than in preceding periods and local traits are developed. Obermaier (1932), for

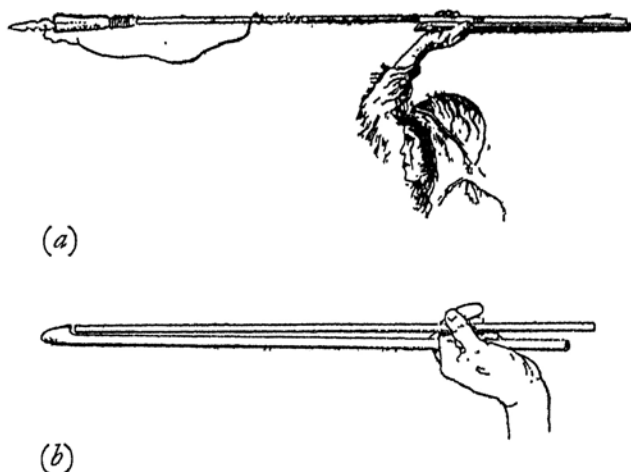


Fig. 30. (a) How the Esquimaux use the Spear-Thrower. (After O. T. Mason). (b) How the Australians use the Spear-Thrower. (After Brouch Smith)

instance, cites an interesting modification of the harpoon confined to the Cantabrian region of Spain. In the Magdalenian of the cave of Pendo, near Santander, exploited for manure, he found two harpoon points with a lateral protuberance at the base perforated by a hole. The absence of this extremely useful device, well known to the modern Esquimaux, throughout the Magdalenian of France indicates either isolation or a very specialised use. The final Magdalenian of La Madeleine in the

Dordogne has furnished a harpoon with a basal protuberance of Cantabrian type, but the protuberance is not perforated.

The later Azilians in both France and northern Spain

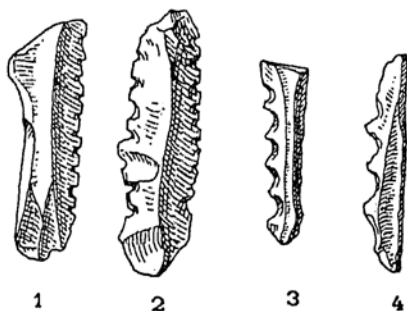


Fig. 31. Denticulate Blades. (After Déchelette)
1-2, Bruniquel (Tarn-et-Garonne). 3-4, Les Eyzies
and Laugerie-Basse (Dordogne)

had harpoons with perforations, but the latter were placed in the median line of the base of the harpoon.

CHAPTER VIII

THE EOLITHIC PERIOD

IN endeavouring to give some idea of the state of our knowledge concerning the existence of man prior to what are known as Palaeolithic times, we are liable to get involved in the question of nomenclature. The definition of such terms as 'Tertiary' and 'Quaternary,' 'Oligocene,' 'Miocene,' 'Pliocene' and 'Pleistocene' is essentially a matter of palaeontology, complicated by the fact that these terms are liable to become defined in terms of the marine fauna, whereas the implements of very early man occur predominantly in land deposits. Moreover, faunal zones are largely climatic, and it is becoming increasingly apparent that the climatic belts of the earth moved freely during geological times, so that the appearance or disappearance of a fauna may be merely the result of change of climate.

Important as may be this question of the limits of the geological periods, however, it is not at present the vital one as regards the study of eoliths. What appears to be more wanted than anything else is a criterion by which artificial origin may be recognised and proved. Chipped flints for which an artificial origin has been claimed are known from all stages of the Tertiary from the Eocene onwards, and it is curious that the older of these seem as convincingly artificial-looking as the newer.

The first supposed eoliths brought to public notice were those found in 1863 by the Abbé Louis Bourgeois in the Upper Oligocene near Thenay. Some of these had

the appearance of having been affected by fire. This, however, was questioned later, the result being claimed as atmospheric weathering. From this time on many discoveries came to light. At Puy Courny in Cantal, France, in 1905, Verworn discovered flint hammers,

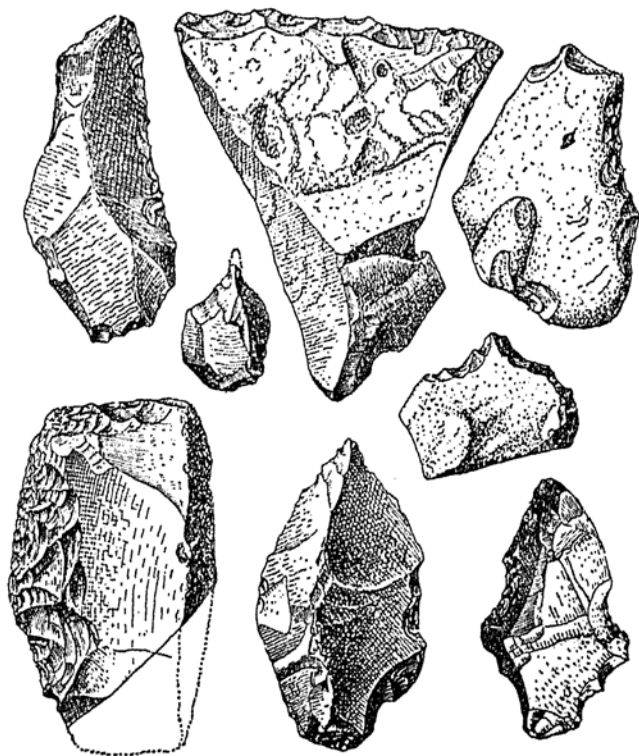


Fig. 32. 'Fagnian' Eoliths from Boncelles, Belgium.
(After A. Rutot)

Scale, $\frac{1}{2}$

scrapers, rasps, points and borers in strata unquestionably of Upper Miocene Age, and in 1907 Rutot discovered the famous pre-Miocene eoliths of Boncelles near Liège in Belgium. Some of these are shown in Fig. 32. Here are scrapers, points and borers which in

any palaeolithic deposit would pass as artificial. Finally, at Clermont, Oise, Breuil found in Lower Eocene strata a group of chipped flints, selected examples of which are shown in Fig. 33. These seem just as convincing as any of later date. In fact, Rutot, the great protagonist of

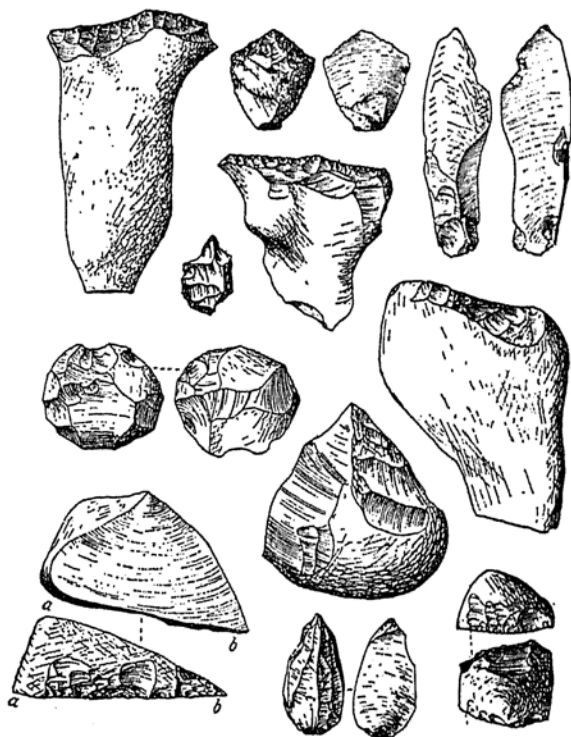


Fig. 33. Eocene Eoliths from Clermont, Oise, France.
(After Breuil and J. Bouyssonie)

Scale, $\frac{1}{2}$

eoliths, on being shown them and not knowing their age, pronounced them to be Strepyan—that is to say, belonging to the dawn of the true Palaeolithic. We must, therefore, if we accept the artificial origin of eoliths, believe that there was no evolution in man's industry throughout the Tertiary. Breuil, however, thinks the

Boncelles eoliths are due to natural causes. He demonstrated actually *in situ* at this locality the wonderful results that have been produced by the pressure and slight movement of superincumbent strata, some of the 'eoliths' being actually attached to their cores and only falling apart from them when disturbed.

Moreover, it has been demonstrated that violent agitation in water can produce forms quite comparable with the Tertiary eoliths. This was effected at the chalk mills of Guerville by Obermaier, Laville, Boule and Carthailac. In the mills lumps of chalk with unbroken nodules were subjected by means of turbines to a centrifugal motion of about 4 m. a second. On carefully examining the resulting flint fragments, these archaeologists found themselves confronted with typical eoliths strikingly similar to those discovered in alluvial river deposits. They showed either partial or entire retouch round the edges, and notched edges more or less deeply incurved. They included specimens that might be classed as scrapers, burins and planing tools.

This experiment is, of course, open to the objection that the effect is produced by a machine and not by natural agencies, though, of course, the machine is producing a result for which it was not designed. However, about the same date Wernert and Schmidt described an accumulation of 'eoliths' of Middle Quaternary date in Würtemberg, where flints, carried along by the stream in the principal valley, were drawn into whirlpools caused by the inflow of a tributary stream, Rutot himself said of this deposit: 'Here there can be no possible doubt: these are pseudo-eoliths' (Obermaier, 1925, pp. 11-12).

Thus we are forced to admit that the early Tertiary eoliths may be chance-products produced either by the

pressure of superincumbent materials, as suggested by Breuil, or by agitation in a whirling stream. The apparently convincing collections have been obtained by selection from a vast quantity of material in areas where flints were very common. *In situ*, or among the material from which they were selected, they are less convincing, because all intermediate grades, back to the obviously unworked fragment, can also be found. Something better than this is required to prove the presence of man; some-

thing more obviously planned.

This is the case with the rostro-carinate implements discovered by Reid Moir in the detritus-bed or Suffolk Bone-Bed beneath the Pliocene 'Crag' of East Anglia. These show a definite design which is repeated over and over again to such an extent that a casual visitor to the exposures can pick out several examples. The rostro-carinate, as its name implies, is a beak-shaped tool with a more or less flat base, opposite which is a carina or ridge (Fig. 34).



Fig. 34. Rostro-carinate Implement from beneath the Norwich Crag.

The Norwich Test Specimen.
(Royal Anthropological Institute)

Scale, $\frac{1}{2}$

North Sea Drift. They are generally capped by the Cromer Forest Bed and that in turn by the *Leda myalis* bed, a shore formation, the constancy of level of which all

round Norfolk is such that the writer considers it to be the equivalent of the well-known 15-ft. Preglacial Raised Beach of southern Britain. The Preglacial age of the Crag is thus well established. Its base rests upon the stone-bed. This stone-bed is the waste of an old land surface.

The Younger Pliocene Crag deposits of East Anglia are roughly classifiable into an older series, the Coralline Crag with 38 per cent. extinct species and 26 per cent.

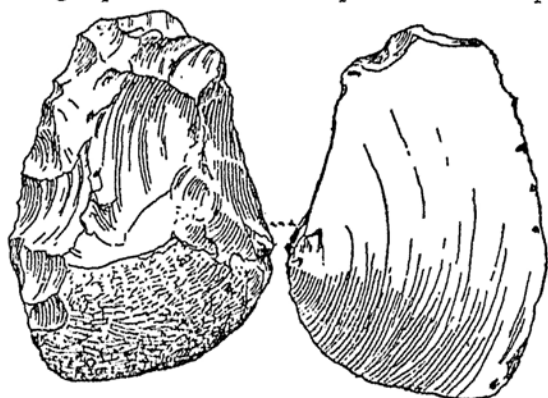


Fig. 35. Flint Side-scraper from below the Red Crag at Bramford, Ipswich.

(*Prehistoric Society of East Anglia*)

Scale, $\frac{1}{2}$

present-day southern species, and a younger series, the Red, Norwich and Weybourne Crag with a gradually diminishing percentage (36 per cent. to 11 per cent.) of extinct forms and also of recent southern species (20 per cent. to 0 per cent.). The Coralline Crag was much denuded by the waters of the Red Crag Sea. For archaeological purposes, the Norwich and Weybourne Crag may be classed as Red Crag. It is at the base of the Red Crag, where it rests on the underlying Older Tertiary Clays or Chalk, that the Suffolk Bone Bed occurs. The Coralline Crag was laid down in a warm sea, but the sea which

deposited the Red Crag became progressively colder with time until it finally harboured only northern species.

On the old land surface or Bone Bed beneath the Red Crag, however, only warmth-loving animals have been found. The implements from this surface, which Reid Moir calls 'Icenian,' show considerable variety. They include scrapers (Fig. 35) and pointed implements (Fig. 36) and, most remarkable of all, the rostro-carinate implements described above. The name 'rostro-carinate' was given to them by Ray Lankester in 1912. A committee of experts subsequently pronounced them to be artificial, a judgment with which the reader will have little quarrel when he contemplates the figure of the so-called 'Norwich Test Specimen,' found beneath the Crag at Whittingham. Nor does this implement stand alone. The rostro-carinate form, although, according to Reid Moir, never common, is repeated sufficiently often to leave no doubt as to deliberate design. The present writer, in a casual visit in 1935, picked out several, of which the best are preserved in the Manchester Museum.

These sub-crag implements are generally of a rich dark, mahogany-brown colour, frequently show striations ascribed to glacial conditions, and occasionally have a burnt and crackled appearance, as if they had been subjected to the action of fire. The supposed glacial striae are especially interesting, in view of the fact that similar striae on Palaeolithic implements occur, according to the Abbé Breuil, only on those that have been subjected to solifluxion. If the surface on which the implements occur suffered glacial solifluxion, this must have happened before it was covered by the Crag, since this in places contains many delicate shells. This is Reid Moir's evidence for a pre-Crag glaciation.

The Bone Bed beneath the Red Crag rests indifferently

on Older Tertiary, commonly London clay, or on chalk. In the Crag itself at Foxhall, three and a half miles east of Ipswich, Reid Moir has discovered an implementiferous floor, as if the advancing Red Crag Sea had halted sufficiently long to permit man to dwell upon its shore. This floor is obviously later than the Bone Bed, and the implements found in it are of a more advanced type, and include hammer-stones, cores, points

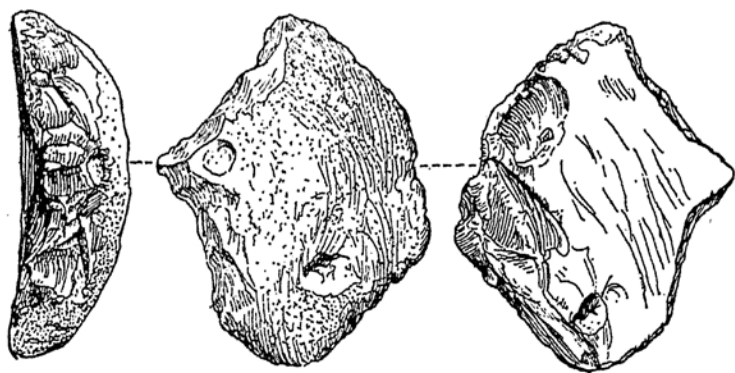
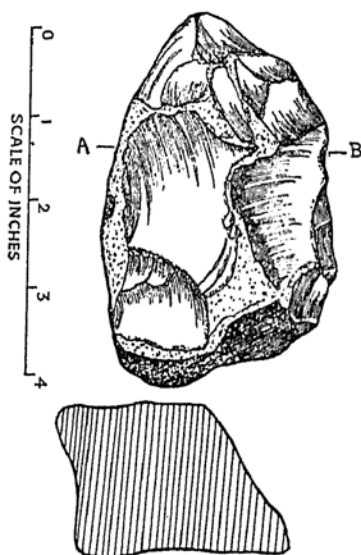


Fig. 36. Pointed Implement from below the Red Crag at Bramford, Ipswich. (*Prehistoric Society of East Anglia*)
Scale, $\frac{1}{2}$ approx.

and scrapers. Several calcined stones indicate that fires had been lighted on the beach.

Still younger and approaching the Chellean in type are the implements from the base of the Cromer Forest Bed. Denudation prior to the latter had in many places removed the crag deposits so that the Forest Bed comes to lie directly on the chalk, from which it is separated by about 18 in. of hard, cemented, ferruginous sand. As the cliffs of the Cromer coast are pushed backward by the sea, this highly resistant bed comes to occupy the foreshore, where it can be easily examined. It is ferruginous sand and contains many large flints with an ochreous patination. When the sand around them is

removed by wave action they form large flint spreads at low water. Reid Moir claims that they can be re-



SECTION A-B.

Fig. 37. Early Chellean Hand-axe from the Cromer Forest Bed, Cromer.

(Royal Anthropological Institute)

cognised by their reddish-yellow coloration, so that although they are only fore-shore specimens, there is no doubt as to their source. In this he is probably right, although the ochreous bed can never be seen to pass beneath the Forest Bed, the base of the cliff being always obscured by shingle. A sample of the implements, which are of very crude Chellean types, is shown in Fig. 37.

No implements have as yet been found in the middle or upper layers of the Cromer Forest Bed, but in the immediately overlying boulder clay of the North Sea Drift Mr. J. E. Sainty has discovered the well-made Chellean *coup-de-poing* shown in Fig. 23. There is no doubt that it is of a much more advanced type than the implements found at the base of the Cromer Forest Bed. According to Mr. Reid Moir, its colour is in every way comparable with many flints occurring in the Upper Fresh-water Bed, which is the highest member of the Forest Bed series. It may therefore represent the type of implement made at the close of Forest Bed times.

We have thus, in Mr. Reid Moir's sequence of Pliocene implements from East Anglia, a clear Pre-Palaeolithic or Early Palaeolithic succession ending up in

undoubted Chellean. He does not regard them as Eoliths—a name which he considers should be reserved for the type of implement obtained from the gravels of the Kentish plateau, gravels from which has also been derived the skull known as *Eoanthropus dawsoni*. These gravels which form a thin capping to the chalk downs are undoubtedly very ancient. It is impossible to conceive of

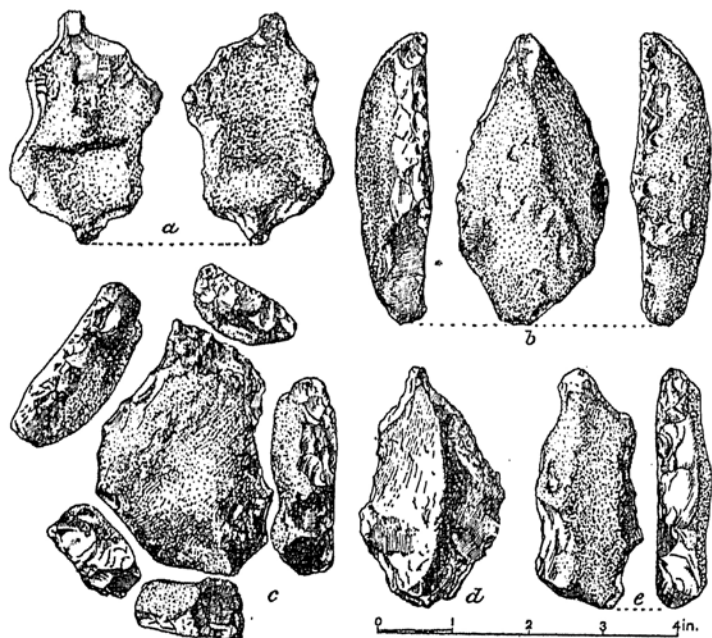


Fig. 38. Eoliths from the North Downs, Kent. (*Stone Age Antiquities*: By permission of the Trustees of the British Museum)

their being deposited with the topography as it is at present. Whether we must conceive, with Mr. Reid Moir, the restoration of the whole Weald denudation, so as to produce a surface on which they could be formed, is another matter. It is just possible that such extensive denudation as he pictures could have taken place in the soft strata of the south of England since the advent of man.

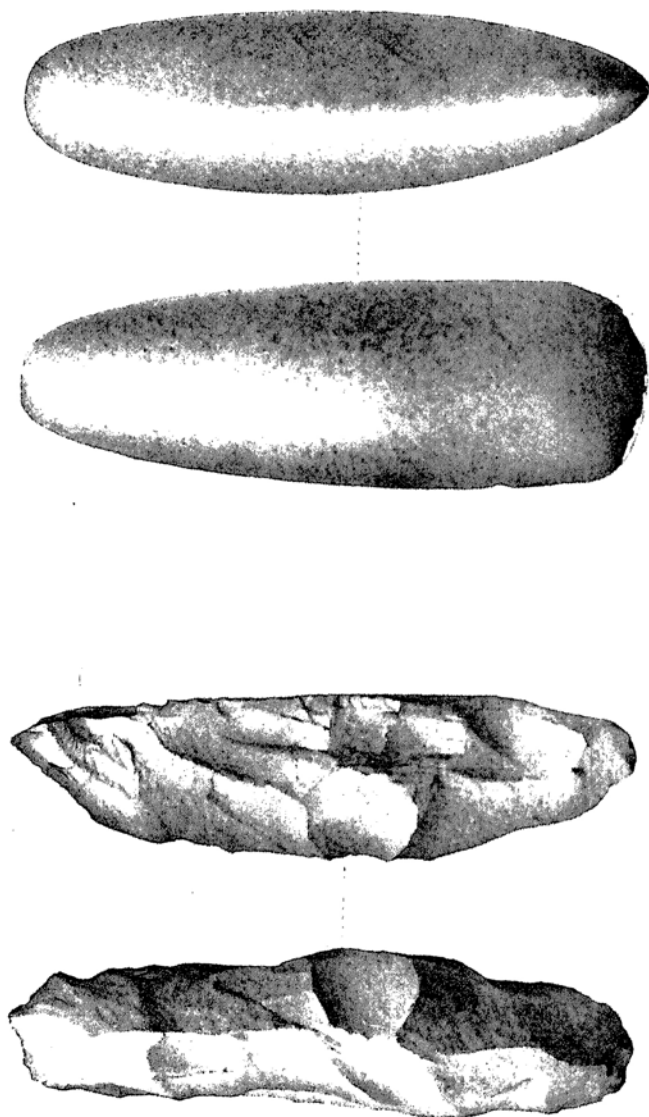
The discoverer of these Kentish eoliths was W. B. Harrison, and an account of them was published by Prestwich¹ in 1889 and 1891. According to Mr. Reid Moir, they are very roughly flaked, with two flattish surfaces, and are about $\frac{1}{2}$ -in. thick. These surfaces, which presented naturally produced striking platforms, have not been modified, but the edges have been extensively flaked, and these edges were used for cutting, scraping and hacking purposes (Fig. 38). Similar implements have been obtained from the Suffolk Bone Bed, from beneath the Red Crag at Bramford, and from glacial gravel at Bolton & Co.'s pit, Ipswich.²

¹ Prestwich, Sir J.: *Q.J.G.S.*, 1889 and 1891.

² Moir, J. Reid: *Proc. P.S.E.A.*, Vol. III, Part 3, p. 307.



PLATE III



1. Nøstvet, Maglemose or Rough-hewn Axe
2. Cylinder Axe of Ertebølle Age
Protoneolithic and Neolithic Axe-heads associated with the Shorelines of Oslo Fjord (after Brøgger)

CHAPTER IX

THE MESOLITHIC, PROTO-NEOLITHIC AND EARLY NEOLITHIC

IN the first edition of the writer's *Quaternary Ice Age*, published in 1914, emphasis was laid on the great hiatus between the Palaeolithic and Neolithic industries of Europe, and on reviewing the situation now in 1938 it is difficult to see that this has been in any way bridged, although the elaboration that man left Europe in the Palaeolithic and returned in the Neolithic may now seem more doubtful. The decadent Palaeolithic disappeared with the Arctic faunas, and with the temperate faunas came a new technique, that of the hafted axe or adze, possibly in response to a novel woodland environment (Clark, 1936). There is no trace of evidence as to whether this latter was the technique of a new race or the discovery of the old. There is, however, evidence that in the interregnum Europe was not altogether unoccupied and to these almost unknown occupants of the country we apply the term 'Mesolithic,' but it helps little to do as has been done of recent years—namely, separate off great portions of the obviously later or Neolithic cultures and dub them 'Mesolithic.' Thus the Ertebölle culture is obviously Neolithic and the Maglemose Proto-Neolithic, so the question of transition resolves itself into the relations of such industries as precede the latter, and here the evidence is of an extraordinarily unsatisfactory nature.

Much of the trouble arises from the definition of industry by means of bone technique, although this is

scarcely avoidable where bone forms the principal material. The Magdalenian, for instance, is essentially a bone industry. It is questionable if it has ever been identified on the basis of its flints alone, although, owing to the improvement of technique in its later stages, an improvement obviously independent of anything which it inherited from earlier industries, there may be certain quite characteristic forms. For example, the denticulate flake shown in Fig. 31 does not seem to be found in any other industry (Obermaier, p. 108).

Now, it is highly unfortunate that many of the industries of the transitional period are found under conditions which have led to the destruction of all bone implements and all fauna. Such are the sand-hill industries of Belgium, North Germany and Poland, characterised by the pedunculated or tanged point. By comparative typology, these are connected up with certain cases in which there is reason for dating, and are referred generally to the cold period immediately following on the withdrawal of the ice—in other words to the Pre-boreal period of the botanists (p. 21). J. G. D. Clark (1936) cites the following:

The Ahrensburg-Lavenstedt culture. Two similar flint finds from sand dunes in the Hamburg district, of which the most distinctive feature is abundant pedunculate points (Fig. 39) and some large non-geometric 'microliths,' as well as blades, burins and scrapers. The pedunculate point is itself little criterion of age. It appears in the last phase of the Aurignacian (Font-Robert), in the Solutrean, though here with unmistakable technique, and in the later Neolithic. The microliths figured by Clark seem to the writer to be hardly true microliths at all. They are certainly not geometric, and the oblique truncation of the blade seems to be the only character allying them to

the Capsian or Tardenoisian. Such oblique truncation is not unknown in the Upper Palaeolithic. No criteria either of pollen analysis, fauna, or stratigraphy are available for the dating of these finds, and the best clue is a certain similarity to the flints of the cave of Hohlen Stein, 100 miles to the south-west, where similar pedunculated forms are associated with perforated and pointed bones of reindeer and a cold fauna with reindeer, variable hare, Arctic fox, white grouse and horse, as well as forest species, like the aurochs, roe deer, beaver and wild pig.

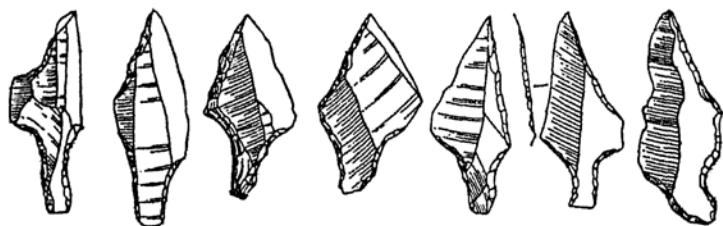


Fig. 39. Typical Series of Flint Forms of the Ahrensburg-Lavenstedt Culture. From specimens in Oldesloe Museum. (From *The Mesolithic Settlement of Northern Europe*, by J. G. D. Clark; C.U.P.)

Scale, $\frac{1}{8}$

This fauna undoubtedly indicates a transition from Late Glacial to Boreal conditions.

Very comparable is the assemblage of pedunculate points and microliths from the cave of Remouchamps near Spa in Belgium, with a similar semi-Arctic fauna. The assemblage has a more definitely microlithic appearance, with lunates and trapezes, and one of the bones has ornamental decoration by means of minute drilled holes (*bohr-ornament*) characteristic of later deposits of Boreal date.

An identical industry of tanged and pedunculated points with microlithic forms characterises the Swiderian industry from the valleys of the Vistula and Bug. The type locality is Swidry, described by Krukowski. The

stations are in sand dunes and are devoid of bone. Inverse retouch, i.e. flaking on the flat side of the point, seem to distinguish the Swiderian from the other industries mentioned. There is absolutely no means of dating. The Tardenoisian micro-burin is absent from all these industries from Remouchamps to Swidry.

Around the northern and western coasts of Sweden and Norway are found a number of industries of partially Palaeolithic aspect, but definitely later date, of which the Komsa and Fosna are typical. The Komsa Culture in Finmark, Northern Norway, has tanged



Fig. 40. Azilian Harpoons,
from Mas d'Azil.
(After E. Piette)

Scale, $\frac{1}{2}$

points, burins, backed blades and scrapers, but also the cleaver and flake axe or rough-hewn axe. They are associated with, and, at Kirkenes, actually contained in the gravel of Tanner's shoreline *d*, the lowest shoreline of the oceanic Littorina Stage, which is the contemporary of the Ancylus stage of the Baltic, and falls therefore in the Boreal period (and not, as stated by J. G. D. Clark, in the Pre-Boreal). At any rate the presence of the rough-hewn axes makes the Komsa culture definitely Proto-Neolithic.

The Fosna Culture lies further south, at the mouth of the Trondjem Fjord, and occupies a considerable stretch of coast in the vicinity. It is similar to the Komsa and has, also, the rough-hewn flake axe. The pedunculate point, which is regarded as the essential feature is also associated at Garves with polished axe heads of a definitely

younger type. It has clearly survived in Scandinavia until a very late date.

On the whole, however, the tanged-point industries which extend from Poland to Belgium through North Germany appear, from their occasional association with a partially Arctic fauna, to be the earliest of the Post-glacial industries of this area.

When we enter the definitely Postglacial period with no trace of Arctic fauna things are much more complex. A number of more or less isolated industries come on the scene and, as Professor Macalister once expressed it, play hide-and-seek with one another across the continent of Europe. The Azilian, Maglemosian and Tardenoisian are all industries of the Boreal period, when the pine was dominant in the forests of North Europe, and before the moisture-loving alder had established its ascendancy, yet they are rarely seen in contact.

The Azilian, with its type locality at Mas d'Azil in the Pyrenees, has as its characteristic implement the flat harpoon of deer's antler with two rows of barbs, and the painted pebbles (Figs. 40 and 41) the markings on which show in some cases a curious resemblance to letters of the Phoenician alphabet, and in others are clearly symbolised human figures. The main areas where this culture is found lie on the northern slopes of the Pyrenees in Ariège and the Dordogne, at Santander in the Cantabrian region of North Spain, and in north-west Britain. Isolated finds have been made at Victoria Cave, Settle, Whitburn, near Newcastle, Inchkeith in the Firth of Forth, as well as at Liège in Belgium, on the eastern slopes of the Alps, and at Birseck near Basle (Clark, 1936, pp. 217-218). In the type locality of Mas d'Azil the Azilian deposits follow above the Magdalenian with 3 m. of intervening loam, and are succeeded by Arisian and Neolithic strata of

small thickness. The associated fauna is entirely recent.

The Tardenoisian has its type locality at Fère-en-



Fig. 41. A Group of Painted Pebbles from Mas d'Azil.
(After Obermaier)

Tardenois, Aisne, France, where it was discovered by de Mortillet in 1896, but the connotation of the term has been extended in later years. Its type implement is the microlith (Fig. 46) and its known distribution is wide, extending from Africa, through Spain, France, Belgium and Holland, Great Britain, Germany, Poland and the Ukraine as well as Palestine. It is found almost exclusively on high ground, commonly over 1,000 ft. and in sandy areas, a relation which Clark (1936) considers to imply an avoidance of forested country.¹

Most of the sites occur in the open and under conditions which ensure a complete disappearance of bone objects. Rarer sites in caves show that there was a rather poor bone industry.

The Maglemosian, in sharp contrast to the Tardenoisian, was a forest culture of the Boreal Period or period of low sea-level, during which the Ancylus Lake occupied the Baltic. At this period the southern half of the North Sea is, on fair evidence, supposed to have been

¹ Mr. Leslie Armstrong has found Tardenoisian implements on clay ground and considers that their absence on such terrain is only apparent, and due to their small size and the consequent difficulty of finding them when embedded in clay, concentration and exposure by wind action being unlikely under such conditions.

dry land. Maglemose harpoons (Fig. 42) in Boreal peat have been dredged from a depth of 20 m. from the Leman and Ower Banks off the north-east of Norfolk,

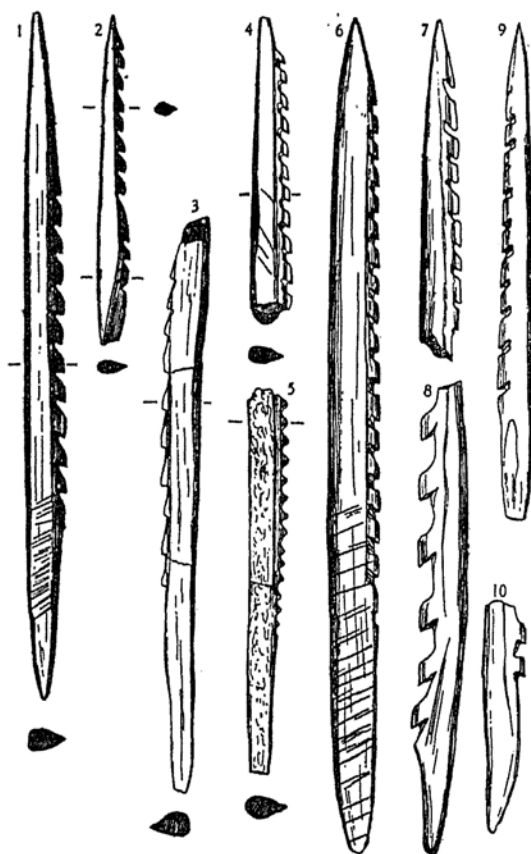


Fig. 42. Notched and Barbed Bone Points from South-eastern Britain, North-eastern France, and Belgium. No. 1 from Hornsea and No. 2 from Skipsea, Yorkshire; No. 3 from the Thames at Battersea; No. 4 from the district of Royston, Hertfordshire; No. 5 from the Thames at Wandsworth; No. 6 from the North Sea between the Leman and Ower Banks; No. 7 from the river Escaut at Wichelen, Flanders; No. 8 from Béthune, Artois; No. 9 from Béthune; No. 10 from near Brussels. (After Breuil, Clark and Haase)

(From *The Mesolithic Settlement of Northern Europe* by J.G.D. Clark; C.U.P.)

Scale, 1 to 5, $\frac{7}{16}$; 6 and 10, $\frac{1}{2}$; 7, $\frac{1}{4}$; 8, $\frac{1}{3}$; 9, $\frac{1}{16}$

and moorlog or submerged peat giving a pine-rich pollen analysis from below 40 fathoms (Clark, *ibid.*, p. 14). Others have been dredged from the Kolding Fjord and Horsens Fjord in Jutland. The Maglemose harpoon (Fig 42) is made of deer antler or bone with a row of barbs along one side, rarely along two. It varies greatly in the number and character of the barbs, including everything from the simple bone point, through the notched point, to the harpoon with well-formed recurved barbs. It is the original type implement of the Maglemose, but at Duvensee (Fig. 43) and Calbe in Germany, and at Holmegarde, Mullerup and Svardborg in Denmark, there is an associated flint and stone industry, characterised by the cleaver and rough-hewn axe (Fig. 43, s) with burins (rare), scrapers, awls, blunt-backed blades and points, as well as microliths, including lunates, triangles and micro-burins, but no trapezes.

On the strength of their somewhat similar industries in stone, a number of other important finds are classed with the Maglemosian. Such are Broxbourne in Hertfordshire and Kelling in Norfolk, and Sandarna, near Goteborg, Sweden. In this latter locality the first sign of the Neolithic technique of stone-grinding appears in a natural pebble roughly of the shape of an axe or adze, but with a cutting edge produced by grinding from either face. Similarly bevelled pebbles are found in the Azilian of the west of Scotland in which the Abbé Breuil detects other Maglemosian tendencies.

Typical Maglemose harpoons have been found at Skipsea and Hornsea in Yorkshire, in the former case in the bed of an extinct mere with flint implements, including a flint-core adze. These specimens have been dated by pollen analysis as belonging to the Boreal Period.¹

¹ Godwin, *Antiquity*, March, 1933, pp. 36-48.

Similar determinations of the age of many stations on the Continent have been made by pollen analysis. Among

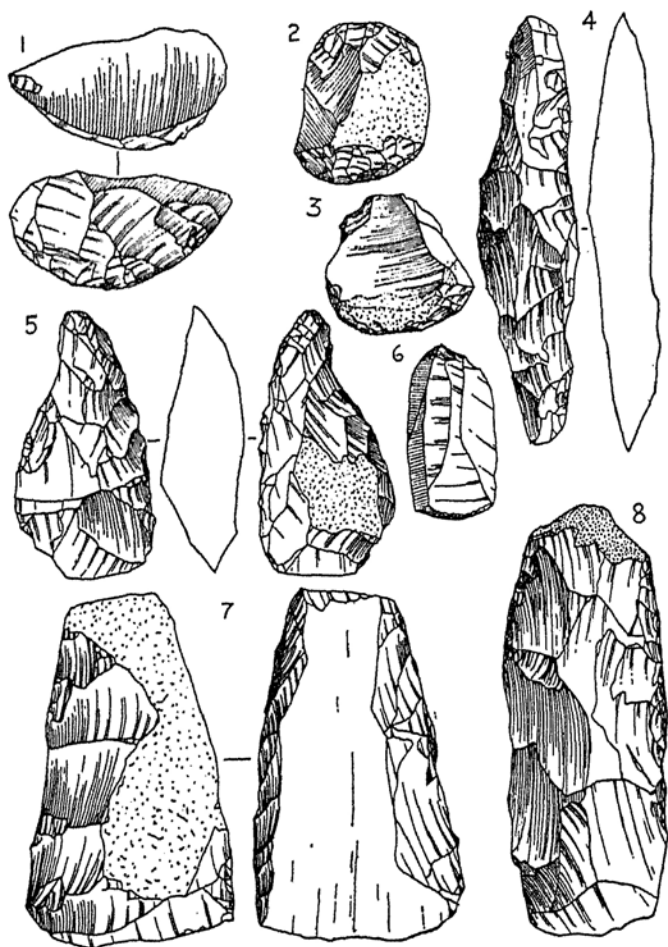


Fig. 43. Maglemose flints from Duvensee, near Lübeck. No. 1, axe-sharpening flake; Nos. 2, 3 and 6, scrapers; No. 4, chisel; Nos. 5 and 8, core axes or adzes; No. 7, flake axe. (From *The Mesolithic Settlement of Northern Europe*, by J. G. D. Clark; C.U.P.)

Scale, $\frac{1}{16}$.

these are Duvensee, Mullerup, Svardborg and Holme-gaard, mentioned above. There is thus a very good body

of evidence for the location of the Maglemose industries in the Boreal period, though in some instances there is a considerable element of alder and mixed oak forest along with the pine, indicating rather the end than the beginning of the period. Among the large number of finds listed by Clark, very few are stratigraphically dated with relation to the Littorina Maximum; they are mainly bog finds.

The Ertebölle Culture is, on the other hand, very definitely related to the Littorina Maximum of the peripheral isostatic regions. The type localities are middens ranged along this shoreline. The culture is obviously Neolithic, the cylindrical, pecked stone axe with ground edge (Fig. 44, 5), and the Limnhavn polished stone axe (Fig. 44, 4) being characteristic forms. Fine blades, scrapers and burins also occur, and the microliths are predominantly trapezes or *petits tranchets* for use as arrow heads. There is well-developed pottery and a certain number of antler and bone tools, including combs and ornaments. It is Atlantic in climate.

It will be noted that the Maglemose and Ertebölle cultures, and, to some extent, the Ahrensburg, all have a microlithic or Tardenoisian element in their make-up. There seems no doubt that this technique came from Africa in the main via Spain and France and that the Capsian is its parent. The axe culture is entirely novel, appearing for the first time in the Proto-Neolithic Maglemosian. The Younger Palaeolithic shows no traces of an axe culture over its entire known distribution. In the Older Palaeolithic there is only the hand-axe,¹ which resembles the Proto-Neolithic axe in being a core-implement, but was apparently used in quite a different way.

Now with regard to the relative dating of the Maglemose

¹ Rare cleavers have been found in the Acheulian of Europe and are common in South Africa.

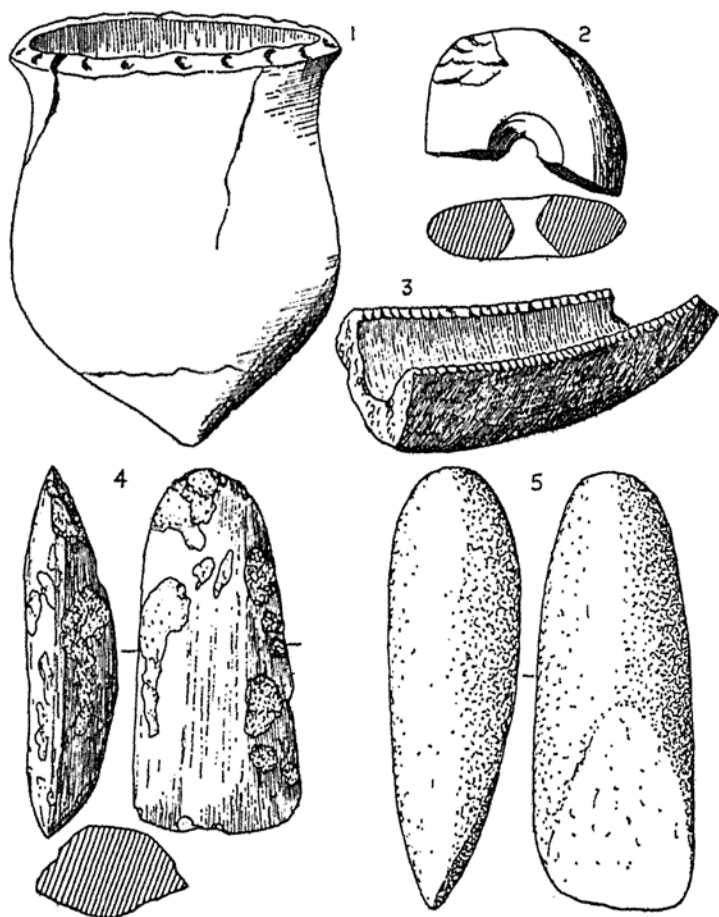


Fig. 44. Pottery and Stone Types of the Ertebølle culture. Nos. 1 and 5 from Brabrand Sö; No. 2 from the Ertebølle Midden; No. 3 from the Faareveile Midden; No. 4 from Bloksbjerg. (Nos. 2 and 5 drawn by Clark in Copenhagen Museum [Nos. E.8070 and B.136]; the others after Thomsen, Madsen and others, and Westerby) (From *The Mesolithic Settlement of Northern Europe*, by J. G. D. Clark; C.U.P.)

Scales: No. 1, $\frac{1}{16}$; Nos. 2 and 3, $\frac{1}{32}$; No. 4, $\frac{1}{8}$; No. 5, $\frac{1}{16}$.

and Ertebølle cultures there is a point that is little appreciated by archaeologists. The Maglemose is well known to belong to the dry Boreal period, the Ertebølle to the warm Atlantic period. In the Boreal period the

general sea-level in north-western Europe was low. England was connected with the Continent and Denmark with Sweden. In Atlantic times, a general rise and transgression of the ocean had isolated England and

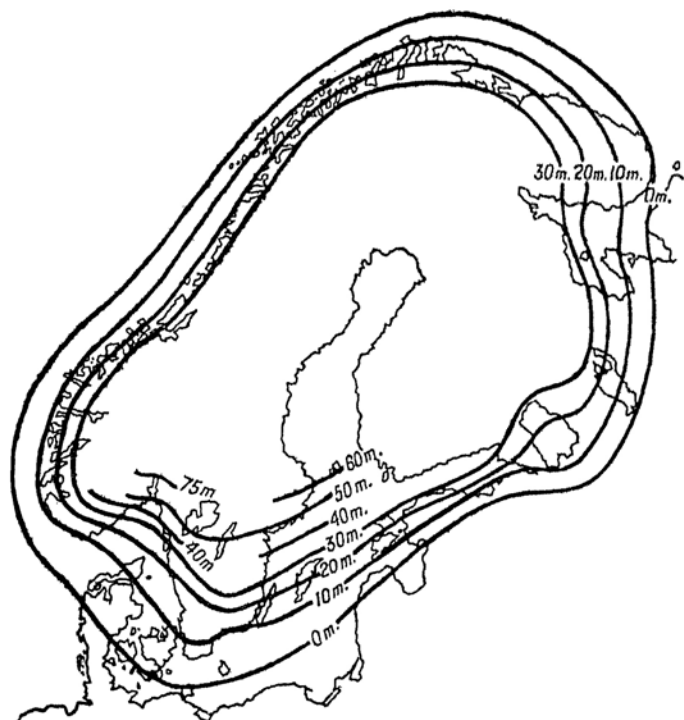


Fig. 45. Map showing the Isobases or Lines of Equal Elevation above Present Sea-level of the Shoreline of *Littorina*-*Tapes* Times—Maglemose to Ertebölle. (After Tanner)

broken the connection between Denmark and Sweden, converting the Baltic from a lake into an arm of the sea. Superimposed on this history of sea-level was the isostatic recovery of the land from its depression beneath the ice sheets.¹

¹ This observation is referred to by J. G. D. Clark (1936, p. 11) and ascribed to Ramsey (1926). It was, however, fully made by the author in 1914. The fact that the 25-ft. is older in the central regions was first elaborated by the author in 1925. It was shown by him in 1936 to apply also to Scandinavia.

This was much more rapid in the central areas near the axes of accumulation of the former ice-sheets than in the peripheral areas. The Littorina-Tapes shore-line was built at any locality when these two motions attained equality. It was not, therefore, of the same date everywhere, but was earlier in the central region, where equality of motion was reached at a relatively early date, and while the general ocean-level was still low. In the periphery it was reached at a later date, when the general ocean-level was much more nearly what it is at present. In other words, there was an outward progress of the maximum of submergence. This is reflected in the archaeology of the beach. In the Oslo Fjord it has been shown by Brögger to be contemporaneous with the Nöstvet Culture, of which the rough-hewn axe or adze (Plate III, Fig. 1) is the characteristic implement. This, however, is of Maglemose age. Further south, in Zealand (Denmark), the culture contemporaneous with the beach is the Ertebölle, with cylindrical polished and ground axes (Plate III, Fig. 2). That is to say, in the peripheral region a later axe-head is associated with the maximum of submergence.

Moreover, in the Oslo Fjord the Ertebölle or thick-necked cylindrical axe is associated with a lower shore-line, as witness the following figures given by Brögger:

CORRELATION OF THE SEA-LEVEL IN SOUTHERN NORWAY WITH
TYPES OF IMPLEMENTS (Plates III & IV)

<i>End of</i>	<i>Oslo</i>	<i>Fjord Mouth</i>
	m.	m.
Nöstvet axe times . .	70	42
Cylinder axe times . .	50	36
Point-necked axe times . .	25	19
Shaft-hole axe times . .	15	10

Furthermore, from an analysis of this table, a still further relation comes to light. If we calculate the percentage of total elevation accomplished at the date of each of the above industries, we get:

	<i>Oslo</i>	<i>Fjord Mouth</i>
	Per cent.	Per cent.
Cylinder axe shoreline .	29	15
Point-necked axe shoreline	64	55
Shaft-hole axe shoreline .	79	76

That is to say that elevation was proportionately more advanced at all stages at Oslo, the more central area, than at the Fjord mouth, the more peripheral.

Oslo lies on the 80 m. isobase of the beach and the fjord mouth on the 60 m. (*see* Fig. 45). Compare the conditions in Zealand, which lies on the 10 m. isobase. Here the cylinder axe is associated with the maximum submergence, so that little or none of the uplift had already taken place.

The same relation has been observed by Högbom in the Baltic in connection with what is known as the 'Åloppe Culture,' but was interpreted by him as an anomaly.

The remains of this culture have a known area of distribution stretching from Uppland, north of Stockholm, across the Baltic islands to Finland and south to Gotland. This distribution covers the isobases of the Littorina Sea from 80 m. to 20 m. (*see* Fig. 45). The culture, which follows a recessional shoreline of the Littorina Sea, has cylindrical greenstone axes of Ertebölle type. The following table after Högbom gives its behaviour with respect to altitude. The last column gives the percentage of the total elevation which had been completed in Åloppe time.

HEIGHT OVER SEA IN METRES

	<i>Åloppe</i> <i>Shoreline</i>	<i>Littorina</i> <i>Shoreline</i>	<i>Percentage</i> $\frac{LS-AS}{LS} \times 100$
Uppland, Åloppgruppen .	35-38	80	52-56
Uppland, Alunda . .	29.5	70	58
Åland, Jättböle . .	30	67	55
Ostergötland, Säter . .	25	47	47
Finland, Viborg . .	12-13	29	55-59
Gottland, Gulbrum, Hemmor	10.5-11	15-16	28-30

With the exception of Viborg, which may conceivably not be a shoreline site, the percentages in the third column seem to indicate that elevation was more advanced in Åloppe times in the central than in the peripheral regions. One would expect emergence to begin soonest and be always more advanced where the maximum of submergence was earliest.

A similar relation holds with regard to the so-called 25-ft. beach of Scotland and Northern Ireland. In Oban, in the centre of isostatic depression, the beach gravel contains Azilian implements. Further out at Larne, in Northern Ireland, and also in Cumberland, it contains axe-heads of Campignian, Nöstvet or Maglemose type. The relation of the Campignian to the Azilian is hardly as definite as that of the Ertebölle to the Maglemose, but there is little doubt that it is later. There is thus abundant proof that the central portions of the beaches are earlier than the more peripheral, and that they cannot be taken as a chronological datum. There is a suggestion that in the central area they date from the later part of the Boreal period.

The Tardenoisian, of which mention is made above, is, on account of its long continuance and wide distribution, the most important of the Mesolithic industries. It is supposed to be African in origin, since the microlithic

element which characterises it occurs throughout the Capsian, which is in its turn generally referred to the Younger Palaeolithic. Of this, however, there is considerable doubt, a matter which is discussed elsewhere (p. 162). At any rate, in Europe it is entirely post-Palaeolithic and Postglacial. The Magdalenian shows no transition to it. There is no doubt that it is essentially an industry of armatures, i.e. small geometrical flakes designed for setting in wooden hafts to make spears, sickles, harpoons and so on. This seems established by Buckley's discovery of a straight line of microliths spaced out at intervals of $1\frac{1}{2}$ to 2 in. in the peat-covered sand of the Pennines, as if the containing shaft had rotted away, leaving them in a row. Moreover, Miss Dorothy Garrod has described a bone sickle shaft from the Natufian (p. 169) of Palestine, with two flint flakes still in place.

The relation of the Tardenoisian to the Younger Palaeolithic cultures were well shown in Mother Grundy's Parlour, Creswell Crags, Derbyshire, excavated by Mr. A. Leslie Armstrong (1905). This cave showed at its base an industry of Aurignacian forms but probable Magdalenian date, with a Pleistocene fauna, including mammoth (*E. primigenius*), rhinoceros (*R. tichorhinus*), reindeer and red deer. The flints included shouldered, Gravette and Chatelperron points. The next zone showed an absence of Pleistocene forms, and a poor flint industry with shouldered points and *Bos primigenius*. The topmost Mesolithic zone, the Upper Middle of Armstrong, has a similar fauna, but an industry with Tardenoisian features, including the micro-burin,¹ and showing a tendency for the points to become microlithic. Black and grey cherts similar to those used in the microlithic industries of the Pennines occur here.

¹A microlithic boring or graving tool with twisted flaking.

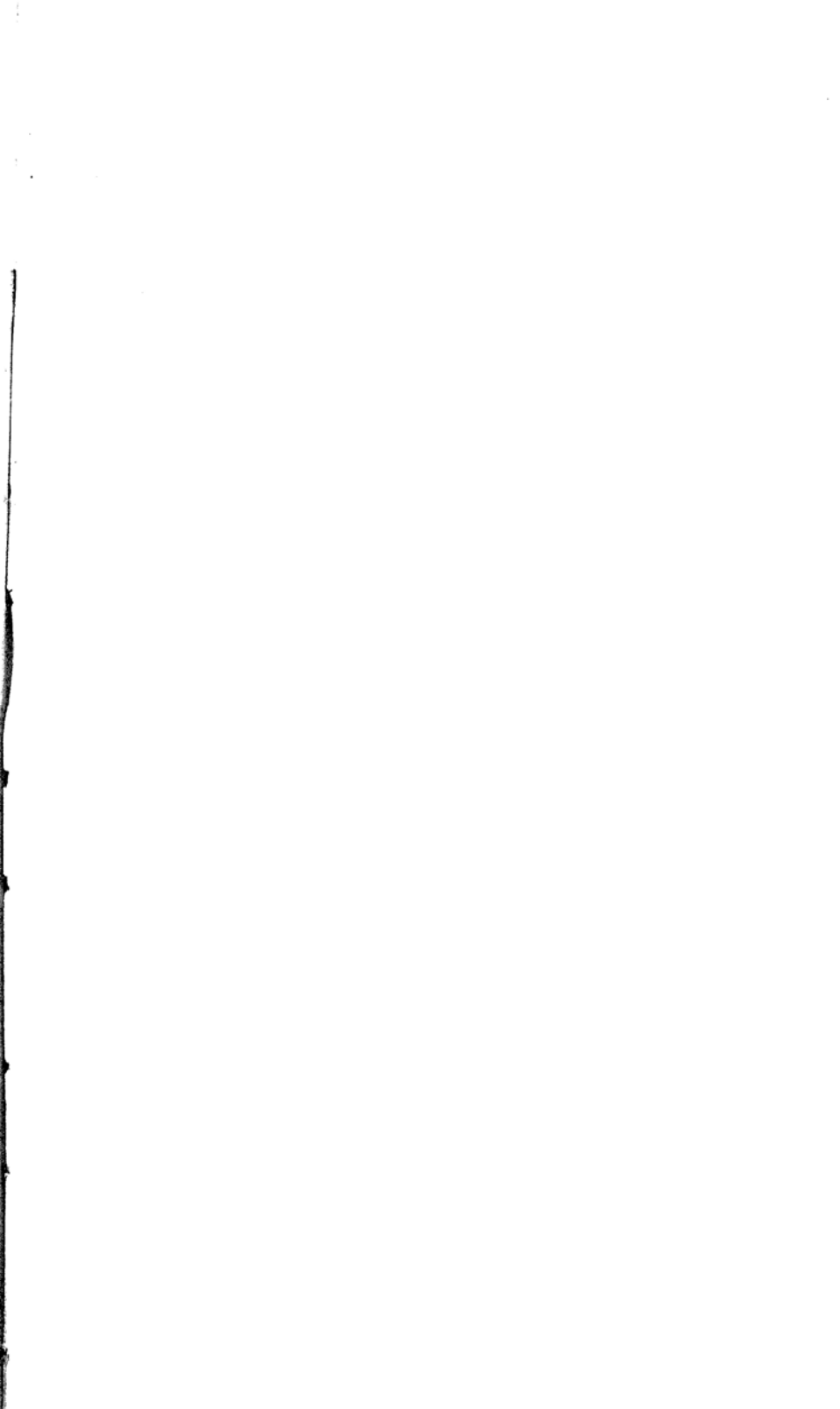


PLATE IV



1. Point-necked Axe
2. Shaft-hole Axe
Neolithic Axe-heads associated with the Shorelines of Oslo Fjord (after Brøgger)

At Shippea Hill in Cambridgeshire, in peat beneath the Fen Clay and 17 ft. below sea-level, late Tardenoisian implements occur 2 ft. below a Neolithic layer of Windmill Hill Culture. The flints include cores, blades, small geometric forms and the micro-burin, but no *petits tranchets*. Pollen analysis by Godwin shows the deposit to have been formed at the pine-maximum (end of Boreal) and before the incoming of the mixed oak forest (Atlantic). A similar date in terms of forest development was found by Bertsch and Reinart near the Federsee in Württemberg (Clark, 1936).

In Belgium the three stages of the Tardenoisian occur, but only the first and last have been observed in superposition. At Zonhoven the lower beds contain an industry resembling that of Remouchamps, with microliths of rather large size and only feebly geometric, while the upper layer yields many geometric forms including trapezes, a few of which have been chipped from polished axes and must therefore be Neolithic (*s.l.*) in age.

At Enseldorf in South Germany there were three Tardenoisian layers in superposition, the central layer being black and so easily distinguishable. In the lower zone the microlithic forms—obliquely blunted points and rough triangles—are Lower Tardenoisian. Those from the central layer, including small geometric triangles and hollow based points, are Middle Tardenoisian, while in the upper zone occur even smaller triangles and the trapezes which characterise the Late Tardenoisian (Clark, 1936).

The relation of the Tardenoisian of Europe to the Late Glacial tanged-point culture (p. 68) is extremely doubtful. A feebly microlithic industry occurs at Remouchamps, with the tanged point, but is not dated faunistically. That is all.

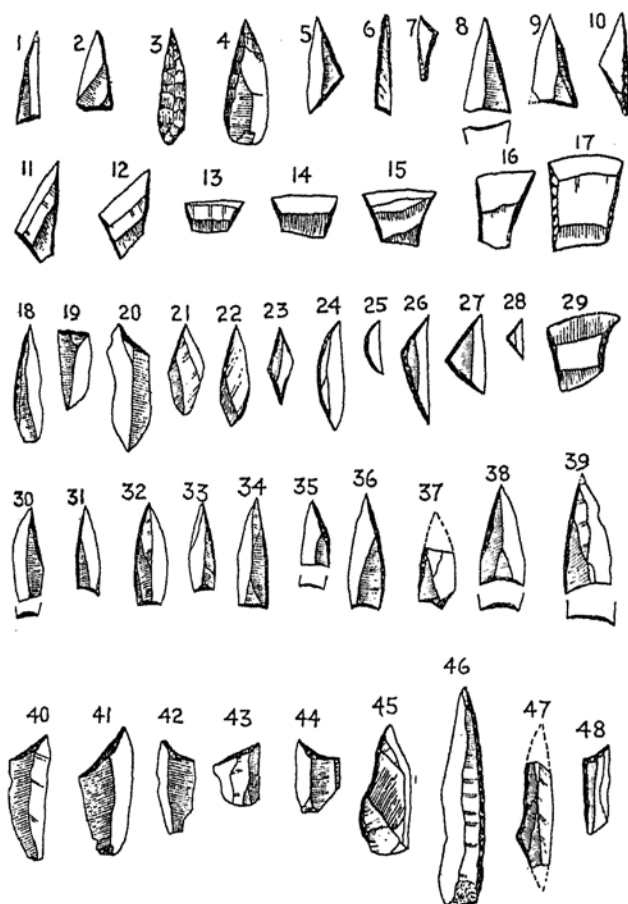


Fig. 46. Stages of the Belgian Tardenoisian. Nos. 1-17, Upper Tardenoisian from Zonhoven (Upper level). (After Hamal-Nandrin and Servais.) Nos. 18-39, Middle Tardenoisian from the valleys of the Amblève, the Ourthe, and the Vesdre. (After Lequeux.) Nos. 40-48, Lower Tardenoisian from Zonhoven (Lower level). (After Hamal-Nandrin and Servais). Nos. 11-17 are trapezes or *petits tranchets*.

(From *The Mesolithic Settlement of Northern Europe*, by J. G. D. Clark; C.U.P.)

Scales, 1-17, $\frac{1}{10}$; 18-39, $\frac{1}{15}$; 40-48, $\frac{1}{2}$

The two forest cultures, the Maglemose of the Boreal and the Ertebölle of the Atlantic, have a definite microlithic element and clearly borrowed from the Tardenoisian, while the Ertebölle has the *petit-tranchet* arrowhead (Fig. 46, 13-17) and is definitely Late Tardenoisian. On the other hand, the Tardenoisians appear to have learned little from the superior forest cultures. One must picture them as an inferior race, living apart in sandy and desolate places, such as sand-hills and mountain tops, and as having little contact with the Maglemosians and the people of Ertebölle.

The Tardenoisian is found over the great part of Europe, from the Ukraine to Spain, as well as in Northern Africa, Palestine, Kenya and Rhodesia, but is absent from the loess region of Eastern Europe. The similarity of the culture and the lateness of the trapeze or *petit tranchet* over the whole area is remarkable. A passage from the Upper Palaeolithic to the Tardenoisian is claimed to have been traced in the Grotte des Enfants, Mentone, at Mother Grundy's Parlour, Creswell (p. 126) and at King Arthur's Cave, Ross-on-Wye. In North Africa it is mixed with later Palaeolithic forms in the Lower Capsian. The Upper Capsian is exclusively Tardenoisian. To those who regard the Lower Capsian of North Africa as contemporaneous with the Aurignacian of Europe, it may seem obvious that the microlithic cultures had their origin in Africa. Those, on the other hand, who, like the present writer, are inclined to think that Africa was always a backwater, and was in the Aterian stage of development while Europe was Younger Palaeolithic (see p. 161), will be justified in assuming that the Tardenoisian industries developed no earlier there than elsewhere.

Passing in review the Postglacial cultures described

above, we have the poorly known tanged-point culture associated with the reindeer, followed by two forest cultures and the ubiquitous Tardenoisian. Of the forest cultures, the Maglemose is the earlier, is of Boreal Age and appears to be the time of the rough-hewn axe or adze (Brögger's Nöstvet type of the *Tapes maximum*) and the *grand tranchet* or cleaver. The only sign of polishing or grinding is the occurrence of pebbles with bevelled edges and others with countersunk hollows. The former also occur in the Azilian of the west. In the succeeding Ertebölle culture of the Atlantic Period, the technique of polishing and grinding definitely appears with the cylinder axe or *walzenbeil* (Brögger's stump-butted round axe of the 50-m. retreat stage of Oslo). On this follows the Limhamn type of axe, later but still in the same period. Both these are obviously Neolithic in character and, in virtue of the appearance of the rough-hewn (or Nöstvet) axe and signs of grinding in the Maglemose, we may justifiably characterise the latter as Proto-Neolithic. This nomenclature seems preferable to that used in the heading of this chapter, more especially as the later stages of Sir John Lubbock's original Neolithic Period are becoming absorbed in the Copper and Bronze Ages, so that the term seems not unlikely to pass out of existence altogether. The Neolithic is the age of polished stone. The only true Mesolithic in Europe is the tanged-point culture, and perhaps also the Azilian.

CHAPTER X

THE TERRACES OF THE SOMME AND THAMES

THE SOMME

THE geological action known as solifluxion has been known to science for many years. It was described by Sir Martin Conway, as early as 1897, as in progress in Spitzbergen, and may be defined as soil-creep under glacial conditions. The alternate freezing and thawing of the rocks and soft surface deposits break them up, and they become easily mixed with water and snow to form a mobile mass which creeps down the slopes under the influence of gravity. Bigot first recognised its importance in the Quaternary geology of France, ascribing the rubble-drift which overlies the 5 to 15 ft. raised beach of Cotentin to that action. It was, however, left to the Abbé Breuil to point out the extreme importance of its recognition in elucidating the early history of man as recorded in the terraces of the Somme in the north of France.

Breuil, between 1932 and 1934, not only made exhaustive investigations of the relations of these terraces to the nappes or sheets of solifluxion materials which separate them into strata, but at the same time discovered important criteria for the discrimination of the implements of the Older Palaeolithic, thus greatly enhancing their use as zone fossils. He has diagrammatised his interpretation of the Somme terraces as in Fig. 47. This may at

first sight seem extremely complex, but the subject has been almost incomprehensible until this explanation was put forward. It is recommended to the reader's most careful attention.

Besides the high gravels of the plateau, there are four terraces on the slopes of the Somme, situated at heights of 45, 30, 10 and 5 m. above the present river. The valley had much the same gradient at the time of formation of the terraces as it has at the present day, so that the terraces maintain their height above the river when

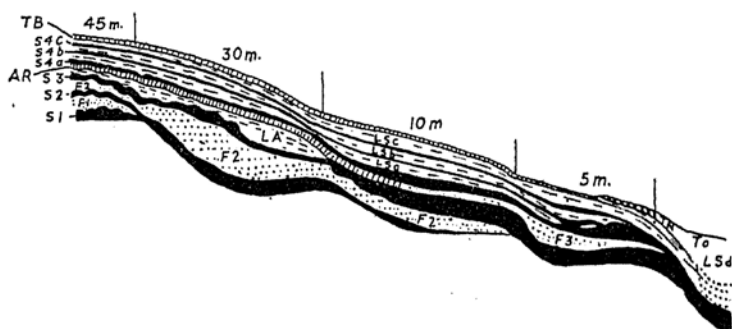


Fig. 47. Composite Section of the Somme Terraces near Amiens. S₁, S₂, S₃, S_{4a}, S_{4b}, S_{4c}, successive solifluxion nappes. F₁, F₂, F₃, terrace deposits. LA, Ancient loess. LS, a, b, c, d, recent loess. AR, argile rouge or alteration loam of the loess. TB, brick-earth. Tø, peat. (After Breuil)

followed upstream. The river now runs on an alluvial plain, formed by the filling in of the buried valley, which descends much below sea-level. The river-gravel formations on the terraces represent similar valley fillings to the higher levels of the past.

The solifluxion nappes descend from the plateau on to all these terraces and river deposits. The lowest nappe of all, S₁, lies upon the floor of the 45-m. terrace, while it is overlain by river gravels, F₁, with a Chellean or Abbevillian industry in the base and Clactonian I higher up. The fauna contains the warm form *Elephas meridionalis*.

As it overlies the deposit of a glacial climate, it is of interglacial age. Breuil ascribes it to the first interglacial period of the Alps, the Günz-Mindel. Why, we shall see later.

The second nappe, S₂, overlies the gravel of the 45-m. terrace, and descends thence on to the floor of the 30-m., and still further on to that of the 10-m. The cutting of these rock-shelves was therefore much earlier than the gravels which lie on them. This nappe, S₂, contains abraded implements of Chellean or Abbevillian and Clactonian I age, while on its surface, in the 30-m. terrace, is found a later Clactonian II. The Clactonian is thus split in two by an Ice Age, the Mindel Glaciation of the Alps.

On S₂ lie the main river gravels, F₂, of the 45-m., 30-m. and 10-m. terraces. Those of the 45-m. terrace contain Acheulian I, those of the 30-m. Acheulian II, and those of the 10-m. Acheulian IIIb. The fauna of the latter contains *Elephas antiquus*, and all three represent the Mindel-Riss Interglacial.

During this Interglacial period, the longest of those recorded in the Alps, the river had time to excavate its level from the 45-m. to at least the level of the 10-m. terrace.¹

Over all these deposits of river-gravel lies the solifluxion nappe S₃, descending from the plateau level to the floor of the 5-m. terrace and further into the buried valley. It contains abraded and derived Levallois I and II, and a cold fauna with *Elephas primigenius*, *Rhinoceros tichorhinus* and the reindeer (*Rangifer tarandus*).

On S₃ lies the Older Loess of the Somme with a cold fauna and Acheulian IV, V. The solifluxion S₃ is

¹ There seems to be some doubt as to this simple interpretation of the Mindel-Riss Interglacial. See p. 100.

elsewhere represented by the pebble bed at the base of this loess. This is the solifluxion of the Riss Glaciation.

The Older Loess covers the S₃ solifluxion on the 45-m. and 30-m. terraces, but only the red clay (argile rouge, AR in Fig. 47) derived from its weathering and erosion is found, washed down from higher levels, on the 10-m. terrace. This red clay yields Acheulian VI and Acheulian VII (Micoquian).

On the edge of the 10-m. terrace, and probably contemporaneous with the red clay produced by the alteration of the Older Loess, as well as on the 5-m. terrace, and in both cases resting on the solifluxion S₃, are river gravels, F₃, with the last warm fauna, *Elephas antiquus*, *Rhinoceros merckii* and *Hippopotamus*, as well as Levallois IIIb and IV, interstratified and mingled with Acheulian VII (Micoquian). This is the Riss-Würm Interglacial, according to Breuil.

On the red alteration clay of the Lower Loess and the gravels of the 10-m. and 5-m. terraces rests the solifluxion gravel S₄ of the Würm Glaciation descending from the higher levels right into the buried valley. This contains *Elephas primigenius*, *R. tichorhinus* and *Rangifer tarandus*. It is equivalent to the pebble bed at the base of the Younger Loess, which pebble bed yields Levalloisian V mixed with Acheulian. The solifluxion gravels contain derived and abraded Levallois IIIb and IV and Micoquian implements derived from the red clay.

Above this is the Younger Loess. This is extremely complex, with four levels and three intervening solifluxion or pebble beds, as follows:

- L_{sa} Lower Loess.
- S_{4b} Second pebble bed and second solifluxion of S₄. On its surface Levalloisian VI with occasional small bifaces.
- L_{sb} Middle Loess, often with a humous layer at its base.

- S_{4c} Third pebble bed and third solifluxion of S₄. Levalloisian VII with Mousterian influences on its surface.
- L_{sc} Upper Loess.
- S_{4d} Fourth pebble bed, generally involved in surface alteration.
- L_{sd} Uppermost Loess, altered except where the marsh covers it. Upper Palaeolithic.

One takes note that the last that is seen of the river is in the Riss-Würm Interglacial; during the Würm it had sunk its bed deep in the buried channel, and is now higher than it has been since. Also we see that the Abbé Breuil now conforms to the 'long chronology' of Penck. He even goes one further and puts the Chellean back into the Günz-Mindel Interglacial, but this is merely apparent, for he is now calling 'Chellean' (or 'Abbevillian') what Commont called 'Pre-Chellean.' The Chellean of Commont and of Penck is still in the Mindel-Riss.

Breuil, moreover, calls attention to a very remarkable relation. The Clactonian is split by the Mindel Glaciation, the Levalloisian at its start by the Riss, and the *coup-de-poing* industries, when unabraded, are always in the Interglacial river gravels. Thus the Chellean is in F₁, or Günz-Mindel; the Acheulian I, II and III_b are in F₂, or Mindel-Riss; Acheulian VI and VII (Micoquian) in F₃, or Riss-Würm. The only exception is Acheulian IV and V, in the Older Loess, supposed to be produced during the retreat of the Riss Glaciation. However, the conditions are sufficient to suggest that the flake industries are Glacial and the *coup-de-poing* industries Interglacial. Breuil pictures them as used by two different populations, living respectively in the north-east and south-west and overlapping in the debatable area of North France, which was occupied by the flake-industry people during the Ice Ages, and by the *coup-de-poing* using people during the Interglacial Periods. In

the later stages the separation tends to break down, and the industries interstratify, one with the other, and even intermingle.

A curious fact that emerges from this interpretation of the Somme terraces is the dating of the loess. The solifluxion sheets, S₃ and S₄, are in each instance followed by loess. That is to say that, if the solifluxion is Glacial, the loess is Late Glacial. This is quite contrary to the accepted views as to the origin of loess, the formation of which seems elsewhere to be the concomitant of oncoming and maximum glaciation. This latter view was taken by Koslowski and Breuil in their paper on the 'Palaeolithic Stratigraphy of the North of France,' before Breuil developed the idea of the glacial origin of the solifluxion deposits. In that paper they divide the loess into three stages, apparently basing their conclusion on the relation to the drift known to Koslowski in Poland.

Recent loess (2), containing Aurignacian, Solutrean and Older Magdalenian. This rests in Poland on the moraines of the second last glaciation, and on those of the first phase of the last glaciation, but never on those of the second phase. At Pulawy, Poland, it is covered by the moraine of the second phase.

Recent loess (1), containing final Levalloisian, contemporary with and influenced by the Mousterian of the South. It rests on the moraine of the second last glaciation, but never on those of the first phase of the last.

Older loess containing Acheulian V (higher Acheulian), found only to the south of the moraines of the second last glaciation and never on them.

Thus, in terms of the Alpine sequence, the recent loess (2) is pre-Würm II or pre-Bühl, the recent loess (1) is pre-Würm I, and the ancient loess is pre-Riss, a view which is comfortably in agreement with that

expressed by Penck in his work on the Alps, except that the latter was not aware of the recent loess (2), which is probably largely a phenomenon of Poland and Russia.

Now the recent loess is everywhere Mousterian (or Levalloisian) and Aurignacian, as, for instance, at Achenheim, north of Strasbourg in Alsace, described by Schmidt and Wernert, where the following section is observable:

		Humus. Neolithic.
Younger Loess	{	(l) Loam-zone (Younger Loess-loam).
		(k) Younger Loess.
		(i) Loam-zone. Aurignacian.
		(h) Younger Loess with Arctic rodents. Mousterian stone implements and hearths.
Older Loess	{	(g) Loam-zone (Older Loess-loam).
		(f) Older Loess. Younger Acheulian.
		(e) Loam-zone. Hearths.
		(d) Older Loess
		(c) Loam-zone
		(b) Older Loess
		No archaeological remains yet discovered.
		A hewn scraper.
		(a) Diluvial sand.

Consequently, since its fauna is the last cold fauna with mammoth, woolly rhinoceros and reindeer, we may assume it to be intimately connected with the Würm Glaciation of the Alps, but, as it is absent from the outwash gravels of the latter yet covers older gravels, it is clearly a phenomenon of advance or, possibly, maximum, and not of retreat.

A conflict such as this is beyond the author's power to resolve. He can only suggest that possibly the loess of the Somme Valley is not the same as that of Germany and the east, but that its accumulation is conditioned by the abundance of outwash sediment in the later stages of glaciation rather than by the dry climate of advance.

This, however, is a weak explanation, for the Somme is far from any outwash deposits of the last glaciation.

Moreover, we are still not out of our difficulties, for the industries Levallois VI and VII seem too late. They are not known elsewhere to be later than the maximum of the Würm, and if, instead of *S_{4a}* we take *S_{4d}* as the Würm, we are left with seven solifluxion deposits preceding it.

However, from this piece of research we have several grand generalisations: (1) The flake industries, Clactonian, Levalloisian and Mousterian, tend to be associated with solifluxion phenomena and a cold fauna, while the *coup-de-poing* industries occur with a warm fauna in the Interglacial gravels. (2) The solifluxion deposits descend to low levels in the buried valley, and prove a repeated low Glacial sea-level, while the Interglacial terraces indicate a rise of base-level. (3) The individual terraces were not formed each in an Interglacial period, but several of them were occupied in the course of one Interglacial. (4) There are three great periods of aggradation, the Chellean, the Clactonian-Acheulian and the Levalloisian-Micoquian, of which the Clactonian-Acheulian seems far the longest.

THE THAMES

With the unravelling of the sequence in the Somme, the deposits of the Thames become less of a puzzle. We should expect these two rivers, lying close together in an apparently stable area, to have similar histories, since we suppose them to be controlled, at least in the neighbourhood of their mouths, by the oscillation of their base-level, the sea. We should expect the Thames, like the Somme, to show three great periods of aggradation separated by epochs of dissection, and we should expect

the solifluxion nappes to separate the deposits of these periods of aggradation from one another. The recent synthetic work of King and Oakley (1936), based upon the accumulated results of many past workers such as Brown (1896), Burchell (1931-6), Chandler (1914-30), Dewey (1913-32), Hinton (1900-7), T. V. Holmes (1892-4), Kennard (1902-22), R. A. Smith (1911-14) and Hazzeldine Warren (1912-34) comes very near to filling these expectations. The results are admirably set out in their diagram (Plate V) of the stages of aggradation and dissection now recorded in various deposits of the Lower Thames Valley. The story told by these figures may seem complex. It is simplicity itself compared to the chaotic state of our knowledge previous to its appearance. Let us take the sections in order as shown there:

Section I. Plateau gravels, probably representing an early glaciation.

II. First observable erosion of Thames Valley. This (stage I and possibly earlier stages) is probably represented archaeologically by the derived and abraded implements of the Boyn Hill and Taplow terraces of *Clactonian I*, *Abbevillian* (or *Chellean*) and *Early Acheulian I, II* types.

M III. In this valley were deposited the Chalky-Jurassic boulder clay of the Great Eastern Glacier and the outwash gravels attached to the same. This is the equivalent of Breuil's S2 of the Somme, and represents the *Clactonian* or *Mindel Glaciation*.

IV. Erosion of the Chalky-Jurassic boulder clay; still the equivalent of S2. Erratics left behind are the source of erratic material in later deposits.

V. Aggradation leading to the deposition of the lower gravels of the 100-ft. or Boyn Hill Terrace preserved at Swanscombe. Abundant *Clactonian II* and a few *Clactonian I* derived and abraded. *Elephas antiquus*,

MR early form, *E. trogontherii*, *Rhinoceros megarhinus* (= *merckii* Auctt.), *Hippopotamus amphibius*, *Cervus elaphus*, etc.

VI. Inter-Boyn Hill Erosion Stage. Truncation of the Lower Barnfield deposits by erosion, which is supposed to have continued until a channel at 20 ft. O.D. was cut at Little Thurrock (Grays), opposite Swanscombe on the north shore, and 14 ft. below sea-level at Clacton, forty miles north-east of Grays on the Essex coast.

VII. Clacton-on-Sea Stage. Aggradation leading to the infilling of the channels mentioned in VI. A late stage of the *Clactonian II* culture in both localities. *E. antiquus* (common), *E. trogontherii* (rare), *R. megarhinus*, *R. hemitoechus*, *H. amphibius*, *Cervus elaphus*, *Megaceros giganteus*, etc.

The Ilford brick earths are ascribed to a slightly later stage. There is no industry, but the fauna includes *E. trogontherii* (a small advanced form referred to in the older records as *E. primigenius* or the Ilford type of Mammoth), *E. antiquus*, *R. hemitoechus*, *R. megarhinus* and *Hippopotamus* (very rare).

VIII. Continued aggradation leading to the deposit of the middle Barnfield or late Boyn Hill deposits at 100 ft. gravels resting on the weathered surface of the Lower Loam. *Middle Acheulian III, IV*, hand-axes and flake tools of the High Lodge or *Clactonian III* type, *in situ*. *E. primigenius* (early form), *E. antiquus* (late form), *Rhinoceros* sp. and temperate plants. End of Interglacial including IV to VIII, which are collectively the equivalent of Breuil's F2 or Clactonian-Acheulian Interglacial.

R IX. Pre-Coombe-Rock Erosion. Late Acheulian implements on erosion surface and Early Levalloisian floors—thick flakes with faceted butts struck from large tortoise cores.

R X. Baker's Hole or Main Coombe Rock Stage. Solifluxion, producing contorted gravel at the top of the

Swanscombe 100-ft. terrace (Upper Gravel), over the Ilford brick earths, and at Northfleet. *E. primigenius*, *R. antiquitatis* (*tichorhinus*), *Equus caballus*, Breuil's S3 solifluxion. This represents the Levalloisian Glaciation.

- XI. Taplow Stage. Aggradation producing the well-bedded gravels of the Taplow or 50-ft. terrace near Maidenhead (Middle Thames twenty miles west of London). *E. primigenius*, *R. antiquitatis*, *Cervus elaphus*, *Ovibos moschatus*, *Equus caballus*. Abraded and striated Early Levalloisian and a floor of Middle Levalloisian (cf. Levalloisian III) underlying Crayford brick earths at Northfleet. Not very cold. Breuil's F3. The Levalloisian-Micoquian Interglacial.
- RW XII. Crayford Stage. Thick and widespread deposits of brick earth which overlie the Taplow Gravels in the main valley. These are sandy flood loams and laminated loess-like deposits believed to represent wind-borne material mainly accumulated in sheets of slack water. Very loess-like and extending on to higher ground. *E. primigenius*, *R. antiquitatis*, *Ovibos moschatus*. Freshwater shells indicating temperate conditions. Cold steppe? The upper brick earth at Crayford shows loamy weathering.
- W XIII. Dissection to present river-level or below. The formation of the Upper Flood Plain Terrace and the cutting of the Buried Channel fall within a period of predominantly cold conditions marked by intermittent solifluxion giving rise to 'trail'.¹ It is, according to King and Oakley, certain that there is more than one trail subsequent to the Crayford. Sections at Ebbsfleet described by Burchell show two solifluxions separated by flood loams overlying the Crayford brick earths. A 'cailloutis' or pebble bed between these solifluxions yields late Levalloisian blades. Let us pursue King and Oakley's synthesis recognising that it has become

¹ A term introduced by Osmund Fisher (1866) to denote any festooned gravels resulting from the sludging of superficial deposits under the frozen subsoil conditions, which accompany a glacial climate in the Periglacial area. Equivalent to solifluxion.

infinitely more difficult because the river deposits are now concealed in the buried channel and there is apparently not the same sequence of subaerial deposits as in the Somme for the preservation, identification and separation of the later archaeological levels.

- XIV. Ponder's End Stage or Upper Flood Plain Terrace Stage No. 1. The flora and fauna of the peaty and marshy deposits of Ponder's End have been described by Hazzeldine Warren, Clement Reid and Kennard, and include Arctic plants and shells, as well as *E. primigenius*, *R. antiquitatis*, *Rangifer tarandus*, *Bison priscus*, *Equus caballus* and rodents, both steppe and tundra types. The Ebbsfleet Late Levalloisian level is supposed by Burchell to be of the same age as Ponder's End, which would thus belong to the Mousterian rather than the Magdalenian, as hitherto presumed on the basis of a single flake.
- XV. Buried Channel Erosion Stage. Cutting of buried channel to 100 ft. below O.D. in the Lower Thames. This channel has a steep gradient falling 80 ft. in twenty miles. The cutting was followed by marked solifluxion, the resulting trail merges into the Upper Flood Plain Gravels. The conditions and sequence of events is admittedly not properly understood.
- XVI. The First Filling Stage: Lower Flood Plain Terrace Stage. Well sections at Halling in Kent in this Lower Flood Plain Terrace show gravels, sands and loams occupying the buried channel of the Medway, which yield *E. primigenius*, *R. antiquitatis*, *Cervus (Megaceros) giganteus* and *Bos primigenius*. This fauna is most important, since it shows that the Buried Channel was completely filled up while the Arctic fauna was in the district. A floor, possibly Upper Palaeolithic in age, has been found in the upper layers of the Lower Flood Plain Terrace at Halling (Cook and Killick, 1924, p. 152).
- XVII. Pre-Alluvium Erosion Stage: Tilbury Stage. The thick deposits of alluvium which have been proved to depths of 50 ft. in the centre of the Lower Thames Valley must

occupy a subsidiary channel cut in the gravels filling the main buried channel. The erosion of this subsidiary channel may be correlated with the period of low sea-level which enabled the Maglemose people to migrate from Denmark to England (*see* Chap. VIII). The deposits of alluvium filling this channel were apparently laid down during the elevation of sea-level which culminated in the Littorina transgression in the Baltic, but possibly continued to the present day as far south as London. In the Medway Valley, Burchell has described from beneath estuarine deposits a floor which yields the Thames Pick, the possible equivalent of the Nöstvet or Larne Axe-head, which dates from the Littorina Sea maximum and from the 25-ft. beach maximum in Great Britain, but may possibly have survived to a later date.

We thus see in the Thames, as well as the Somme, the records of a glaciation of Clactonian Age (Stage III), of one of Early Levalloisian Age (Stages IX and X) and one of probable Mousterian and Upper Palaeolithic Age (Stages XIII–XVI). We see also the terrace records of two Interglacials, the first an apparently long period embracing considerable changes of river-level (Stages V–VIII), and the last a shorter period (Stages XI and XII), in which the cold fauna of the preceding Ice Age, including *E. primigenius*, *R. antiquus* and *Ovibos moschatus* apparently did not leave the country, but the temperate character of which is indicated by the freshwater shells. This is a very interesting fact, for the warm fauna with *Elephas antiquus*, *Rhinoceros merckii*, and *Hippopotamus* was in occupation of the Somme at this date. It looks as if the land bridge across the English Channel was submerged before the arrival of the latter.

It will be noticed that in the long Clactonian-Acheulian Interglacial, the record left by the two rivers is not the

same. The Somme has left river gravels on the 45-m., 30-m. and 10-m. terraces, which the Abbé Breuil ascribes to Acheulian I, Acheulian II and Acheulian IIIb respectively. If this archaeological sequence is a succession in time, the river suffered continuous depression of its bed during the interglacial period. Not so the Thames however. It deposited at 100 ft., dropped to 20 ft. and rose again to 100 ft. This discrepancy awaits further investigation.

However, this synthesis of Messrs. King and Oakley confirms in the main that of the Abbé Breuil. It brings out clearly the low sea-level of the Ice Ages, and, as in the Somme, shows that there is no connection between the erosion of the terrace platforms and the subsequent deposition of the terrace gravels.

In view of the apparent discrepancy between the Somme and the Thames as regards the level of the river in the Acheulian interglacial, it is noteworthy that Alice Bowler Kelley gives a different reading from the Abbé Breuil of the succession in the Somme. She puts a period of lower level between the deposition of the lower and higher gravels of the 30-m. terrace and before the deposition of gravel on the 10-m. terrace.

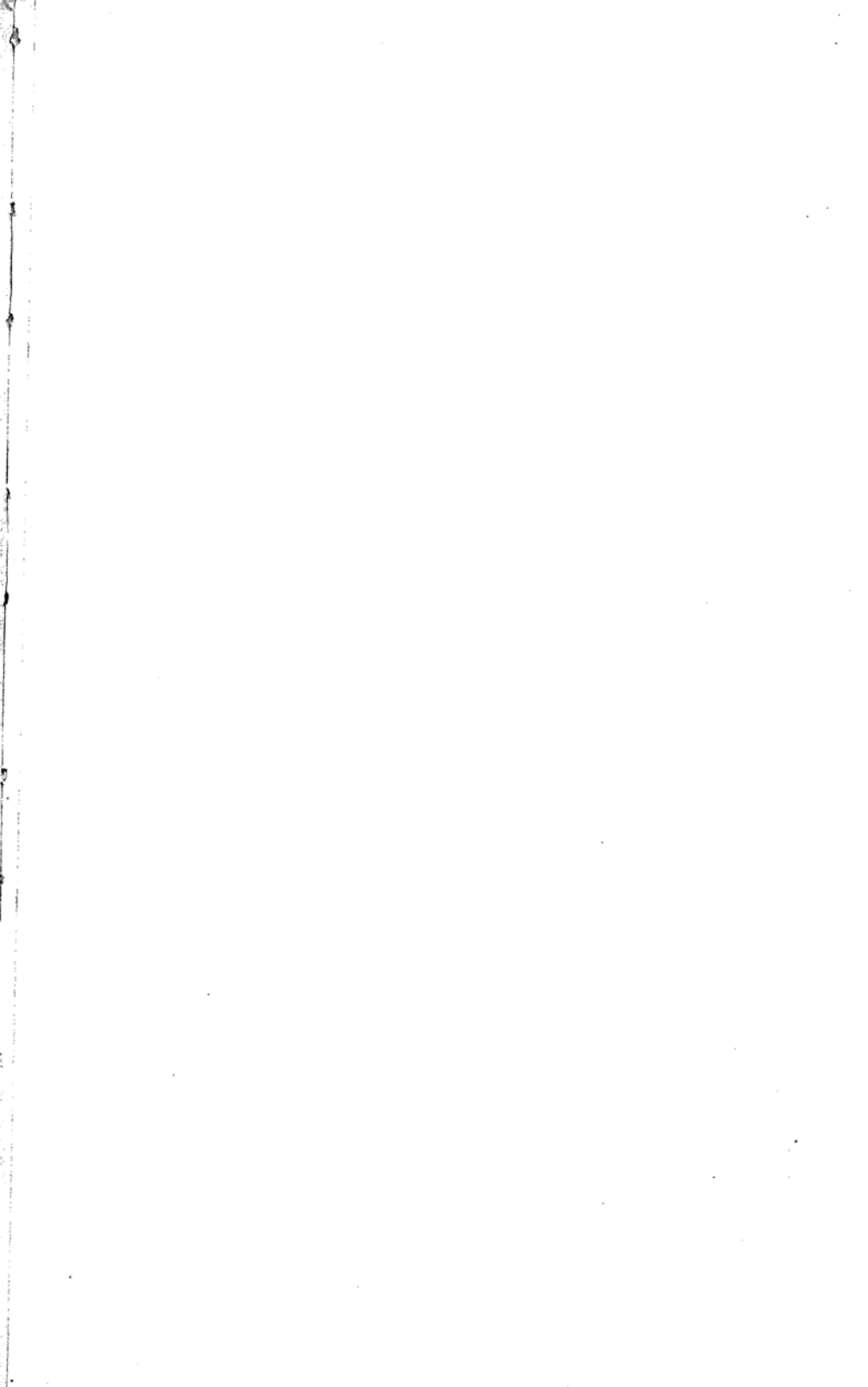
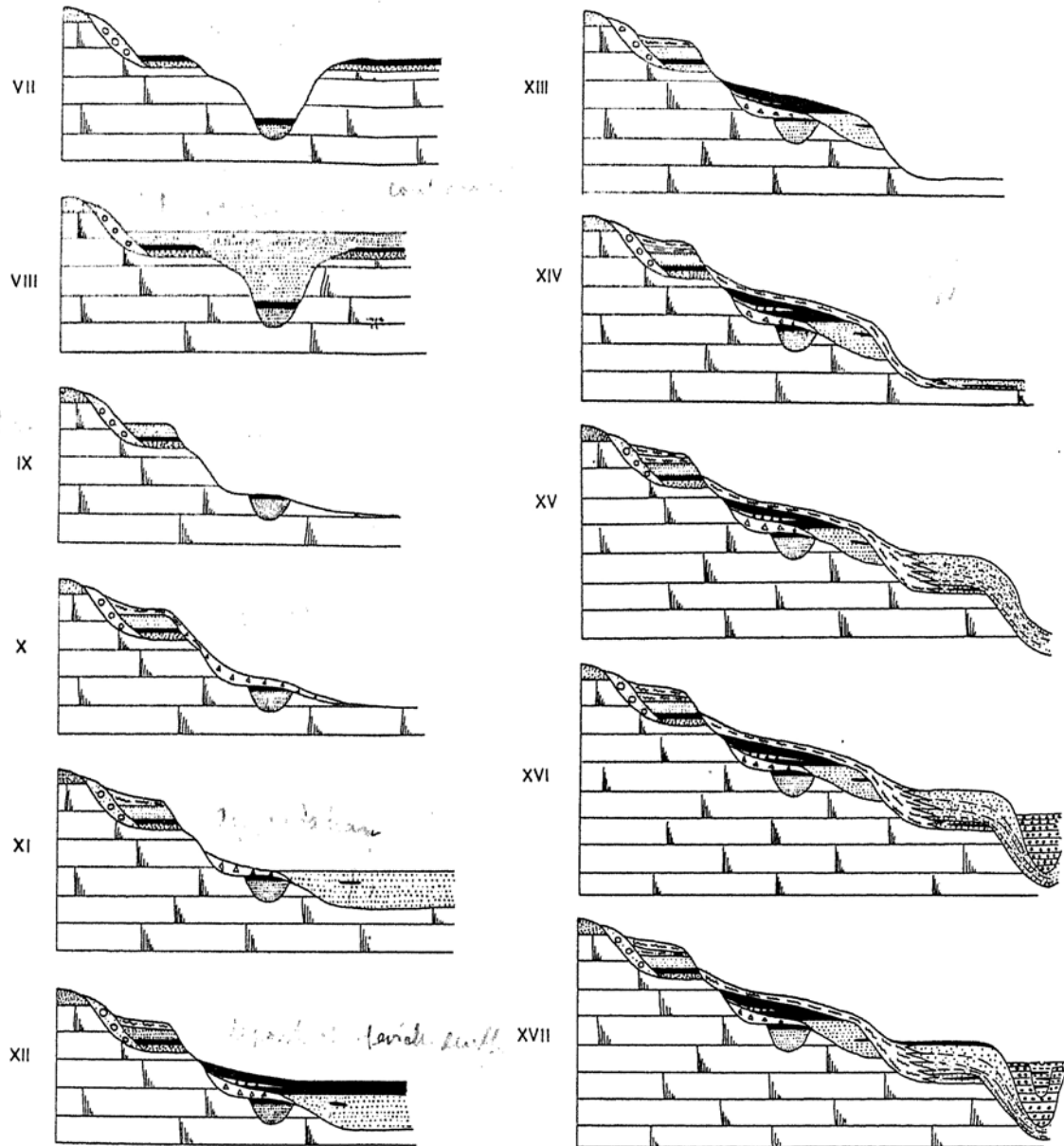


PLATE V

Diagrammatic sections illustrating stages
(I-XVII) of the Pleistocene succession in the
LOWER THAMES VALLEY





CHAPTER XI

GREAT BRITAIN IN THE STONE AGE

THE generalised accounts of Stone Age industries presented up to the present have dealt in the main with those of continental Europe, more particularly France, where Palaeolithic archaeology has been most intensively studied. France has the type localities of all the main Palaeolithic subdivisions and thus forms a natural starting-point. Its richness in remains is largely due to the fact that the northern glaciations hardly affected it, and certainly did not invade it. The relations to the Glacial periods must be inferred from the interstratification with periglacial deposits (Chaps. IV and X) and the occurrence of cold faunas.

England and Germany have true glacial deposits, but, on the other hand, a less complete archaeological record. Southern England appears however, for a considerable proportion of the time, to have been merely a province of France, and closely resembles it in most of its industries. Indeed, in the Eolithic and Pre-Palaeolithic periods we have the more complete record, thanks to the investigations of Mr. Reid Moir in East Anglia, and the descriptions in Chap. VIII deal very largely with his country. In Older Palaeolithic times the Lower Thames had a very similar history to that of the Somme and its terraces and industries have already been dealt with in Chap. X.

RIVER TERRACES OF THE SOUTH OF ENGLAND

The fluctuations of river-level in the Upper Thames Valley, above Goring Gap, where the river breaks through

the chalk escarpment, do not necessarily present the same pattern as those of the Lower Thames, since the control of sea-level is largely wanting. They have long been studied by Sollas and others, but we owe our most up-to-date account of them to Sandford. The uplands around Oxford are capped by a weathered boulder clay called the Plateau Drift, and all the river-terraces contain materials derived from its denudation. One of these terraces below Goring Gap has yielded primitive Chellean implements, thus indicating that the Plateau Drift is Pre-Chellean.

The terraces of the Thames above Goring Gap in the Oxford district are:

	<i>Height above River ft.</i>
The Handborough Terrace. Warm	100
The Wolvercote Terrace and Channel	40
The Summertown-Radley Terrace { Lower or Cold Gravel . . } { Upper or Warm Gravel . . }	20
The Flood-plain Gravels	10
Buried Channel.	

The Handborough Terrace, which bears no direct relation to the 100-ft. terrace of the Lower Thames, has yielded *Elephas antiquus* of archaic form, *E. trogontherii* and other related elephants, but no implements. The Wolvercote Terrace has yielded neither fauna nor implements, but the Wolvercote channel, which is cut into the terrace, is richly fossiliferous and implementiferous. The fauna is warm and includes *Elephas antiquus*, and the implements include derived Chellean, and unworn Middle or Upper Acheulian or Micoquian. Over the gravels of the Channel is a filling of silt which has yielded a flake instrument of possible 'Mousterian' type. On the top of this are the Warp Sands, supposed to be a solifluxion

deposit, and thus indicating a glacial climate. The lower or cold gravels of the Summertown—Radley Terrace contain *Elephas primigenius* and *Rhinoceros tichorhinus*, and its upper or warm gravels *Elephas antiquus*, *Rhinoceros leptorhinus*, *Hippopotamus* and the little shell *Corbicula fluminalis*. Only worn or derived Late Chellean and Acheulian implements have been found. No implements and few or no fossils have been obtained from the Flood-plain Gravels. It seems impossible as yet to correlate this succession with the Lower Thames.

In the valleys of the Severn and Avon, Professor Wills and Miss Tomlinson have found the following system of terraces, correlated by Wills as follows:

Severn	Avon	Character	Elevation at Mouth of Severn
Woolridge	—	?	about 200 O.D.
Bashly Green	No. 5	Temperate fauna (shells).	110
Kidderminster	No. 4	Warm fauna and Acheulian.	65
Main	Nos. 2 and ? 3	Outwash of Younger Drift. Cold fauna.	35 ?
Worcester	? No. 1	Outwash of Welsh Readvance.	-25 ?

The single Acheulian implement obtained in No. 4 Terrace of the Avon is the only record of Palaeolithic man, but with the accompanying warm fauna of *Elephas antiquus* and *Hippopotamus* it almost certainly represents the Acheulian Interglacial. The higher No. 5 Terrace is coterminous with the Eastern Drift. It must be either older than it or of the same age, as to which there seems to be some doubt. These two terraces may be the 30-m. and 15-m. terraces of the Somme, the tidal range in the Severn Estuary accounting for their great height. The Cold Terrace (Main or No. 2 Avon) is the outwash of the

Younger Drift, which we shall attempt to show in Chapter XI is Levalloisian in age. The Worcester Terrace (? No. 1) is outwash from the Youngest Drift and is probably Younger Palaeolithic, but no implements are known from it.

THE INTERGLACIAL DEPOSITS OF EAST ANGLIA

The glacial succession in East Anglia has been given in Chapter IV, but may be summarised here as follows:

Upper Chalky Boulder Clay, Outwash and Solifluxion.

Acheulian Interglacial Deposits.

Great Chalky Boulder Clay (Chalky-Jurassic, or Chalky-Kimmeridgian), Great Eastern Glaciation of Solomon.

Erosion and weathering.

North Sea or Scandinavian Drift (? Floating Ice).

Cromer Forest Bed. Chellean.

Crag	} Pre-Chellean.
Stone Bed	

No implements or fossils are known from the period of erosion and weathering between the North Sea Drift and the Great Chalky Boulder Clay. It may not be truly Interglacial.

The Acheulian Interglacial is well established. Its deposits rest either in basins on the Great Chalky Boulder Clay or in valleys cut through the latter. They are overlain either by the upper chalky boulder clay, its outwash, or periglacial solifluxion deposits associated with it. The most important are:

- (1) *Hoxne*. A series of old lake deposits lie between the great chalky and upper chalky boulder clays, and display the succession shown in Fig. 48. It will be noted that, according to the botanical investigations of Clement Reid, a cold period is intercalated in the middle of the Interglacial. This is the Late Acheulian level. Above it was an Early Mousterian (presumably Levalloisian) floor discovered by Reid Moir, and in

the lower layers, above the great chalky boulder clay, were found a few Clactonian flakes.

- (2) *Foxhall Road, Ipswich.* The Interglacial beds in this locality have yielded to Boswell and Reid Moir a fairly complete archaeological record, but botanical evidence is wanting. Both Early and Late Acheulian are represented in their proper order, and the early types of hand-axe are associated with

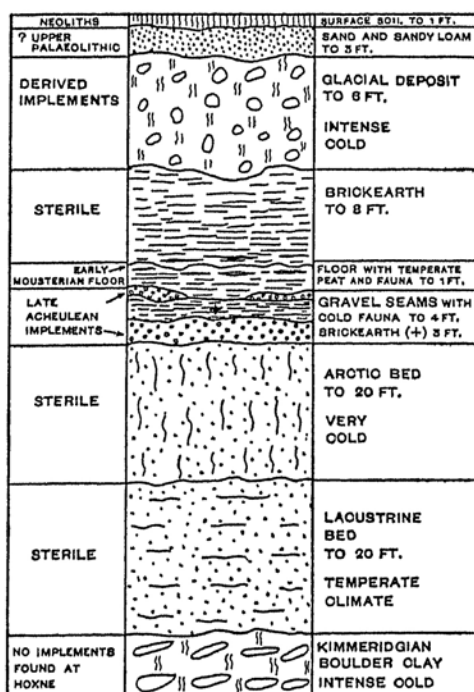


Fig. 48. Composite Section of the Lake Deposits at Hoxne, showing the Climatic Changes and Horizons at which Flint Implements occur. (After Reid Moir)

rostr-carinate forms. The Early Mousterian of the top layers is definitely Levalloisian with faceted striking platforms, while the flakes associated with the Early Acheulian are Clactonian without faceted platforms and with a wide striking angle. We thus see that the characteristic succession of this Interglacial is (1) Clactonian with or without Lower Acheulian; (2) Upper Acheulian; (3) Levalloisian. This is directly

comparable with Breuil's Interglacial between solifluxions S2 and S3 on the Somme (*see* Chap. X). The overlying deposit, in the case of Foxhall Road, is a contorted drift or trail; the contortion may be due either to ice or to solifluxion.

- (3) *High Lodge, Mildenhall.* Here the upper chalky boulder clay occupies a hollow cut in the interglacial deposits and in the Great Chalky Boulder Clay. The relations as portrayed by the Abbé Breuil are shown in Fig. 49. Bed 3 has yielded highly evolved Clactonian implements (unfacetted platforms) with beautiful flat retouch, and beds 4-5 evolved Acheulian and two Levallois flakes. Lower Clactonian implements have been obtained from the underlying great chalky boulder clay. There is nothing here which cannot be fitted into the Acheulian

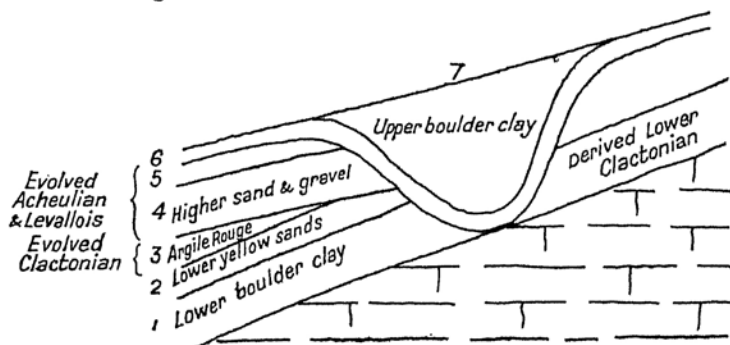


Fig. 49. Section of High Lodge, Mildenhall. (After Breuil)

Interglacial. Even the evolved Clactonian, which is a highly skilled product (Fig. 50), but with definitely unfacetted striking platforms, is not out of place.

- (4) *Whitlingham.* In the valley of the River Yare at Whitlingham, east of Norwich, Messrs. Sainty and Halls have discovered an Acheulian floor 10 ft. deep in river gravel, which lies some 40 to 45 ft. above the present river. The presence of chalky Neocomian boulder clay at a higher level on the valley slopes seems to indicate that the valley has been excavated through the products of the Great Eastern Glaciation. The implements, of which there were 250, are entirely unworn: Late Acheulian hand-axes, scrapers and flakes. There were a few battered and striated Chellean hand-axes obviously derived from an older deposit.

- (5) *Warren Hill*. The gravels in which this section is excavated form a group of mounds rising from the low level alluvial plain of the River Lark near Mildenhall in Suffolk. Breuil gives the following stratification:

- (5) Aeolian Sand with Upper Palaeolithic.
- (4) Remnants of chalky boulder clay (Upper Chalky).

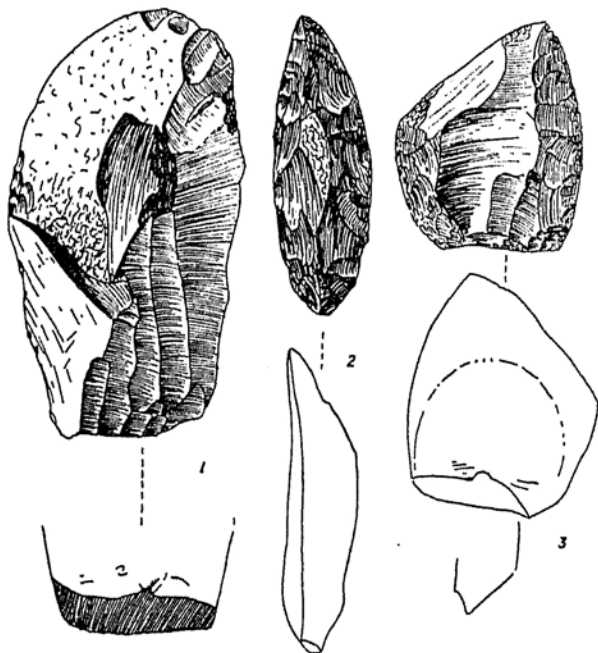


Fig. 50. Clactonian *évolué* from High Lodge, Mildenhall. Most recent in England. 1 Scraper, 2 & 3 Points. (After Breuil)

Scale, $\frac{1}{4}$

- (3) Stratified Gravels. Evolved Acheulian and Clactonian.
- (2) Glacial Gravels. Derived Chellean and older Clactonian.
- (1) Yellowish-grey clay like the Contorted Drift of Cromer.

These gravels have been extensively collected from in the past, but apparently without much differentiation of horizon. Mr. J. D. Solomon has made a most interesting typological study of over 700 specimens preserved in the

Sturge Collection in the British Museum. These were first separated into the following categories:

(1) Much rolled	.	.	109
(2) Slightly rolled	.	.	90
(3) Unrolled but bleached	.	.	300
(4) Unbleached	.	.	174



Fig. 51. Chellean Implement from Warren Hill. Much rolled. Evolved Clactonian point from Warren Hill. (After Solomon)

Scale, $\frac{1}{4}$

The much rolled specimens (1) were in the main Chellean or Pre-Chellean hand-axes, roughly and irregularly flaked with deep bulbs or percussion and many hinge fractures, indicating removal by a stone hammer. They are roughly pear-shaped and their edges are anything but straight. There are a few flake implements.

The slightly rolled specimens (2) are definitely Acheulian of a fairly advanced type. They are almost all ovates—that is to say, hand-axes of oval shape with an edge worked all round the specimen. Two are twisted. There were only two implements at all referable to the Early Acheulian.

The unrolled but bleached specimens are the most

numerous. The bulk are still ovates (Fig. 52). Many of them have a 'cleaver' form (Fig. 52) (cf. the Stellenbosch

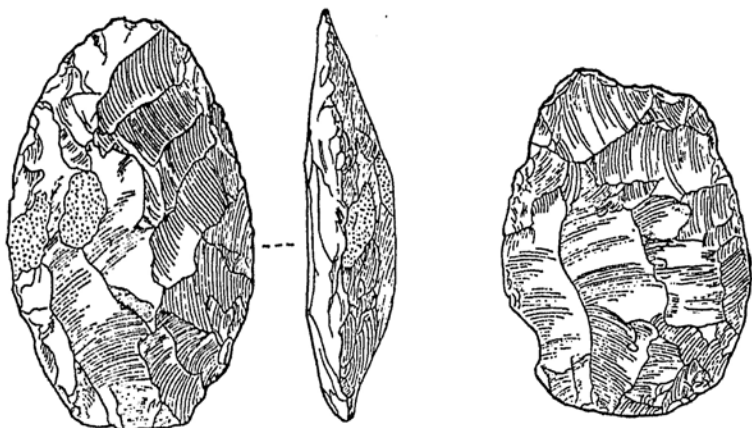


Fig. 52. Hand-axe and Cleaver from Warren Hill, Patinated but Unrolled. (After Solomon)

Scale, $\frac{1}{2}$

industry of South Africa). Others are elliptical or discoid or cordiform (Combe Capelle type). A few are twisted.

The unrolled and unbleached specimens (Fig. 53) are

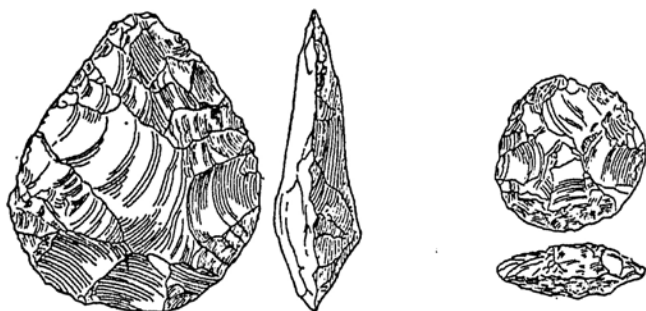


Fig. 53. Late Acheulian Hand-axe and Disc, Unpatinated, from Warren Hill. (After Solomon)

Scale, $\frac{1}{2}$

similar, but the workmanship is finer and the thickness less. These must have been incorporated in the gravel very soon after their manufacture.

The flake implements from Warren Hill, apart from ovates made from flakes, are all rolled and patinated. Many show an unfacetted striking platform of Clactonian type making an angle of considerably more than 90 degrees with the main flake surface. Crude *racloirs* occur among the slightly rolled specimens, but the finer forms, comparable with those of High Lodge (p. 107) are unrolled but fairly heavily patinated. There is not a single flake of Levalloisian or Mousterian type—that is to say, with a facetted striking platform and an angle of approximately 90 degrees—in the collection.

The most striking features of this collection are as follows:

- (1) The very abraded character of the Chellean implements, indicating that they are much older than the others and may have been through a preceding glaciation.
- (2) The fact that the Chellean implements are all of the local dark flint, in contrast to the later ones, some of which are of Lincolnshire grey flint. The glaciation to which they owe their abrasion—that is, the Great Eastern—brought the grey flint into the area and made it available to the successors of the Chelleans.
- (3) The almost total absence of Lower Acheulian forms, indicating that Lower Acheulian man did not occupy the area. The Lower Acheulian period of the Thames Valley is that of the 100-ft. (and perhaps higher) terraces, indicating a sea-level which would have submerged the Warren Hill area, now entirely beneath the 50-ft. contour.
- (4) The total absence of Levalloisian or Mousterian types, showing that glaciation supervened before the advent of Levallois man. The latest Older Palaeolithic industry of Warren Hill is pure Acheulian.

The whole investigation gives an extraordinarily fine picture of the industry of the latter part of the Acheulian Interglacial, and shows what can be done by typology alone, provided the specimens are sufficiently abundant.

It remains to give some account of the 100-ft. terrace of the Thames, which has been investigated in detail at Swanscombe by Messrs. Smith and Dewey. The section is shown in miniature in Plate V, from which it will be seen that the deposits of the terrace are of very different ages. Overlying an older boulder-clay, which is quite local, are gravels of two ages, separated by a flood-loam. The lower gravels are Clactonian, the upper Acheulian, while the highest beds of all do not belong to the terrace-deposits proper, but are subaerial, and may include the deposits of the succeeding Glacial and Interglacial periods. They include a number of twisted ovates, one of which is comparable with a form from La Micoque. La Micoque, according to the Abbé Breuil's interpretation (Chap. X), belongs to the later or Riss-Würm Interglacial.

The gravels proper, Lower and Middle, reproduce the characteristic succession of the Acheulian Interglacial—namely, Clactonian at the base and Acheulian of two stages above. Levallois I and II do not appear here.

Thus we see in all the leading Interglacial deposits of the south-east of England some recognisable part of Breuil's S₂-S₃ or Mindel-Riss Interglacial of the Somme Valley—namely, at the base Early Clactonian, separate or mixing with Early Acheulian, then Middle Acheulian, and, finally, in places Early Levalloisian. These beds occur between the Clactonian and Levalloisian Glaciations. In other words they are Mindel-Riss (Chap. X).

THE LEVALLOISIAN OF GREAT BRITAIN

The Levalloisian of Britain is the time of formation of the coombe-rock, a deposit which Breuil regards as the product of solifluxion in chalk country. It has long been recognised to overlies Levalloisian floors and contain

Levalloisian implements, and the fact has been repeatedly emphasised by Dewey. It has a cold fauna, including the mammoth, the woolly rhinoceros and the reindeer, and is clearly the product of a Glacial climate. It is also the period of the Upper Chalky Boulder Clay of Ipswich, which has yielded to Reid Moir (1920) 'early Mousterian' tortoise-core flakes, some of which, according to the figures, have faceted striking platforms and are therefore Levalloisian. Similar implements are found in the brown boulder clay of Hunstanton, where they are said to accompany Upper Palaeolithic forms. A possible explanation of this admixture is suggested in Chapter XII Burchell finds similar Levalloisian implements in the uppermost so-called 'Hessle clay' of Yorkshire.

This brown boulder clay of the east of England one feels tempted, therefore, to refer to the Levalloisian Glaciation, and so identify it with the Upper Chalky Boulder Clay of Suffolk. Herein lies a difficulty, for it is of quite a different type. The Suffolk boulder clay is intensely chalky. The brown boulder clay is supposed to be confined to the lowlands of north-west Norfolk. Mr. Sainty, however, informs me that this is not strictly true, but that it occurs further south at considerably higher altitudes. Is it not possible that it completely changes its character on crossing the chalk wolds, by the often invoked mechanism of retardation of the lower layers of the ice on rising slopes?

The interpretation of the remaining records of Mousterian man in England is not an easy matter. The descriptions were published long before Breuil evolved his distinctions between Clactonian and Levalloisian and restricted the meaning of the term 'Mousterian.' We may fairly safely conclude that there is no Mousterian *s.s.* in England, since it is absent in the north of France, being

replaced by Levalloisian. With regard to the separation of Clactonian and Levalloisian we must, I think, have less confidence. The change appears to have been of an evolutionary character, the facetting of the platform and the 90-degree striking angle appearing gradually. Such zonal characters are always difficult to apply in geological zoning. The actual position of the base is indefinite and possibly varies with locality.

However, with the passing of the Levalloisian Glaciation there should be no more Clactonian. The change in character takes place in France somewhere in the lower strata of the cave of La Micoque, the summit industry of which is pure Levalloisian mixed with a small Acheulian hand-axe industry. This is the Micoquian and characterises Breuil's S₃-S₄ Interglacial. Its record in England is not so obvious, though occasionally hand-axes in the upper layers of sections are designated 'Micoquian.'

In the Thames Valley, Levalloisian man appears in and under the main coombe-rock, in the 50-ft. or Taplow Terrace, with a cold fauna, including *Elephas primigenius*, *Rhinoceros antiquitatis* and *Ovibos moschatus*, and in or on what are taken to be the gravels of the same terrace at the base of the loess-like Crayford brick-earths. The brick-earths of the Thames are apparently the equivalent of the loess, which, in the Somme, follows upon the solifluxion of the Levalloisian Glaciation. The loam-like upper portion may represent weathering in the succeeding Interglacial. The whole is followed by deposits of 'trail' representing the last glaciation or glaciations. The subsequent history of the Thames Valley, the formation of the Flood Plain Terrace and the subsequent cutting and infilling of the first buried channel took place before the cold forms of the Late Pleistocene left the area, but of Palaeolithic man we see as yet little more.

Mr. J. P. T. Burchell has done a good deal to clear up this portion of the succession in the Thames Valley and bring it into line with that of the Somme. He has pointed out that the Levalloisian coombe-rock is a definitely older solifluxion deposit than the trail, which he considers to be the peri-glacial product of the last glaciation. According to him, the main coombe-rock divides the 50-ft. or Taplow Terrace of the Middle Thames above London into two parts. Thus at Acton and West Drayton he notes the following section:

- (5) Surface soil.
- (4) Trail.
- (3) Brick-earth.
- (2) Unstratified gravel, contorted, with masses of chalk and London clay = Coombe-rock.
- (1) Stratified gravel.

Bed (2) is a solifluxion deposit eroding and disturbing bed (1). Similar Levalloisian implements to those found on the surface of the Boyn Hill terrace occur in an abraded condition in bed (1) and in a striated and abraded condition in bed (2). Burchell identifies bed (2) with the main coombe-rock. In bed (3) there are floors with unrolled and unpatinated implements of Levalloisian type.

Mr. Burchell considers the much thicker brick-earth of Crayford on the Lower Thames as equivalent to that of the above section. This also has Levalloisian floors and is overlain by trail, but there is no coombe-rock at the base.

A very similar sequence has been described by A. D. Lacaille and K. P. Oakley (1936) at Iver in the Middle Thames. Brick-earths 4 ft. thick with Middle and Late Levalloisian implements overlie a solifluxion deposit 1 ft. 6 in. thick resting on a river gravel with derived Chellean, Clactonian, Acheulian, and Early Levalloisian implements.

We thus see in these sections and in several others pointed out by Mr. Burchell the Levalloisian persisting after the main coombe-rock solifluxion. If the analogy with the Somme holds, it should, however, mingle with the late Acheulian and produce a composite industry, the Micoquian, and this it appears to do, for at Iver the upper red weathered portion of the brick-earth which has been affected by decalcification and weathering yields Acheulian hand-axes, and Mr. Burchell points out that Mr. E. G. Spurrell in 1880 found a hand-axe in the classic floor at the base of the Crayford brick-earth, and has himself found a broken but unrolled hand-axe in the lower loam of the following section at Longfield, near Fawkham Station:

- (1) Surface soil.
- (2) Contorted gravel and clay. Trail.
- (3) Upper loam.
- (4) Contorted gravel and clay. Trail.
- (5) Lower loam, with hand-axe.
- (6) Coarse gravel.
- (7) Coombe-rock.
- (8) Chalk.

This section is also stratigraphically important, since it shows the trail and coombe-rock in superposition.

Finally, in the Ebbsfleet Channel, which has been excavated through the main coombe-rock into the chalk,

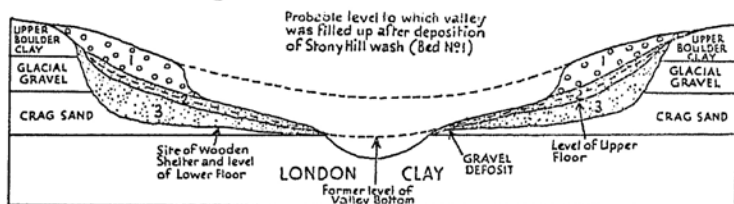


Fig. 54. Diagrammatic Cross-section (not drawn to scale) of Messrs. Bolton & Co.'s Valley. The position of the wooden shelter and that of the Upper and Lower floors is indicated. (1) Stony Hill Wash. (2) Greyish sand, with ferruginous concretions. (3) Sand. (After Reid Moir)

and is therefore of post-coombe-rock age, Mr. Burchell has found in a gravel bed between loams one large and three small hand-axes along with Levalloisian and Clactonian flakes. This looks very like the Micoquian.

I have stressed these recently found sections because

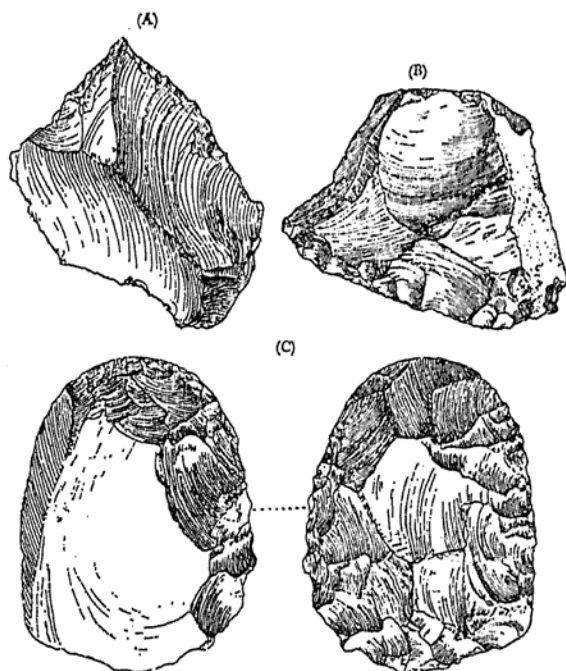


Fig. 55. Flint Implements from the Lower Floor in Messrs. Bolton & Co.'s Brickyard, Ipswich. (A) point; (B) fan-shaped racloir; (C) hand-axe. (*Royal Anthropological Institute*)

Scale, $\frac{1}{2}$

they bridge a gap and bring us up to the last or Micoquian Interglacial. At the end of this should come the Mousterian proper or its equivalent Levalloisian industry.

We now pass to the Ipswich district, where Mr. Reid Moir has found in Messrs. Bolton's brickyard, in a dry valley tributary to the Gipping, two floors related to one another, as shown in Fig. 54. The lower appears to

represent the transition from the Mousterian or Levalloisian to the Upper Palaeolithic, for it has yielded Audi blades (Fig. 56 and p. 12) and side-scrapers, Mousterian points and a small *coup-de-poing* (Fig. 55). The upper floor is clearly Middle Aurignacian, with keeled and nosed scrapers, core-scrapers, end-scrapers on blades, points, notched flakes and burins (Figs. 58-60), while the Stony Hill wash above has yielded several implements of Proto-Solutrean type (Fig. 61) worked on both faces, and at the top in the surface soil are Neolithic arrow-heads and a re-flaked polished axe.

Before leaving this very remarkable section, with its succession of Late Mousterian, Aurignacian, Solutrean and Neolithic cultures, it should be mentioned that Reid Moir records from the lower floor two very remarkable finds, namely a piece of rough pottery and the remains of a wind shelter of wood, similar to that known to have been used by the extinct Tasmanians. Such finds are unknown elsewhere in the Palaeolithic of Europe, and it is, no doubt, on

account of them that the Abbé Breuil refuses to accept the whole succession as anything but Neolithic. Of course, the Neolithic does reproduce in places most of the preceding types of implement, and the preservation of wood in Palaeolithic deposits is, to say the least of it,

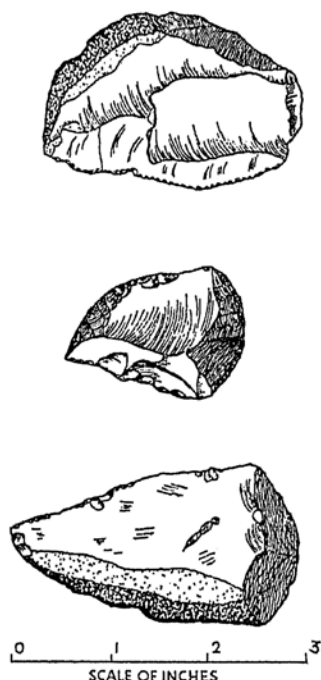


Fig. 56. Flint Knives, similar to Abri Audi Points, from the Lower Floor in Messrs. Bolton & Co.'s Brickyard, Ipswich.
(After Reid Moir)

rare. Still the observed succession cited above seems a distinct argument in its favour. Neolithic implements are seldom so deeply buried, and obvious recognisable Neolithic appears in the surface soil. The presence of a graver is also significant.



Fig. 57. Flint Implements from the Lower Floor in Messrs. Bolton & Co.'s Brickyard, Ipswich. (A) Racloir; (B) Scraper. (*Royal Anthropological Institute*)

Scale, $\frac{1}{2}$

BRITISH MOUSTERIAN CAVE DEPOSITS

We now pass to the cave-deposits, where we again find the Mousterian or Levalloisian as the basal member. Unfortunately, most of the British caves were excavated before the importance of flint implements was fully realised. There was little attempt at detailed stratigraphy, and many of the collections are now lost. Fortunately, we have a guiding light on the subsequent succession in Mr. A. Leslie Armstrong's fine section of the Pin Hole Cave, Creswell Crag, Derbyshire. This cave is excavated in magnesian limestone, and affords a record of three Mousterian levels of occupation, followed by a rather late Younger Palaeolithic, which may or may not be representative of that of the rest of England.

The section is shown in Fig. 63. It will be noted that there are two levels at which slabs of rock fallen from the roof provide a convenient punctuation. The associated Arctic fauna proves them to be of glacial origin. The remains of Mousterian man occur below,

between and above these slab-layers, and in each case are marked by the presence of a relatively warm or temperate fauna. The lower layer of Mousterian is mainly coarse hand-axes, commonly of quartzite and crystalline stalagmite, but with a few flint flakes, including

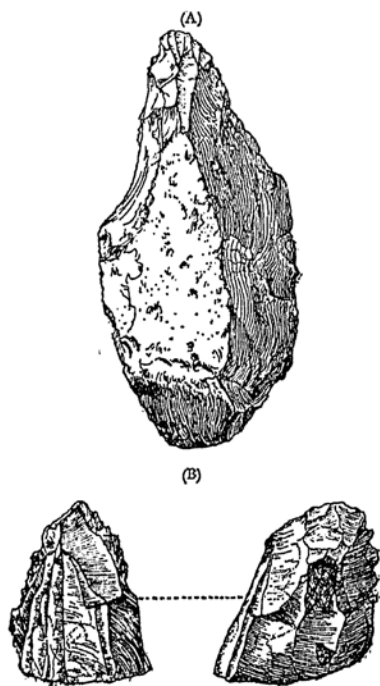


Fig. 58. Flint Implements from the Upper Floor in Messrs. Bolton & Co.'s Brickyard, Ipswich. (A) Nosed scraper. (B) Core-scraper. (*Royal Anthropological Institute*)

Scale, $\frac{1}{2}$

a superb side-scraper of flint. There were also some bone tools, including a knife and two awls. The flint side-scraper was the largest flake of this material found in the cave and, judging by type and technique, might be classed as Clactonian. It has the characteristic oblique striking platform and pronounced bulb of

the Clactonian. It is considered by Mr. Leslie Armstrong to represent 'a chance product of the normal Mousterian industry of the Pin Hole, or an importation' (*British Association Report*, 1936). The associated fauna is a moderately warm one, and includes mammoth, giant deer, horse, bison and lion.



Fig. 59. Flint Blade-scraper from the Upper Floor in Messrs. Bolton & Co.'s Brickyard, Ipswich. (*Royal Anthropological Institute*)

Scale, $\frac{1}{2}$

The second Mousterian zone occurs between the slab-layers and is again moderately warm, including horse, bison, giant deer and lion. The tools are of quartzite, crystalline stalagmite and limestone, with some bone implements, including a bull-roarer and an implement with two prongs. These latter are very remarkable as products of the Mousterian, more especially the bull-roarer. There was a fine side-scraper in quartzite from this level.

The third Mousterian level rests immediately on the second slab-layer and marks the upper limit of the lower cave-earth. The associated fauna is a moderately cold one, and the layer merges into the Aurignacian and Proto-Solutrean level of the upper red cave-earth. The implements of this level are not yet described.

The distinction between the lower yellow and the upper red cave-earth is an important one, and Mr. Leslie Armstrong has come to the conclusion that it is due to submergence of the lower subsequent to deposition. The magnesian limestone fragments and blocks in the lower cave-earth are greatly decomposed, and so are the walls of the cave at the same level. Indeed, at each slab-layer the wall is definitely recessed, as if eaten away by

the solvent action of the water at each level. That lacustrine conditions existed in the immediate neighbour-

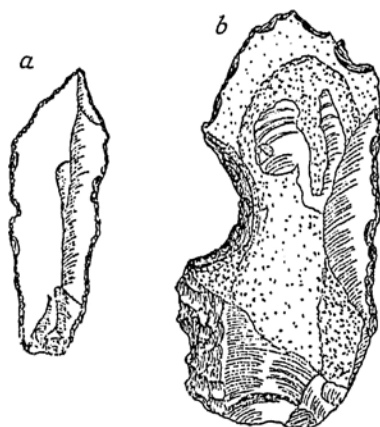


Fig. 60. Flint Implements from the Upper Floor in Messrs. Bolton & Co.'s Brickyard, Ipswich. (a) Point. (b) Notched flake. (After Reid Moir)

Scale, $\frac{2}{3}$

hood is indicated by the frequency of remains of pike and roach in the Mousterian (2) and (3) zones. Mr.

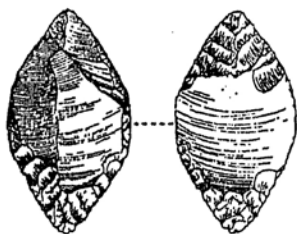


Fig. 61. Early Solutrean Blades from Stony Hill Wash in Messrs. Bolton & Co.'s Brickyard, Ipswich. (*Royal Anthropological Institute*)

Scale, $\frac{2}{3}$



Fig. 62. Flint Arrowhead from the Surface Soil in Messrs. Bolton & Co.'s Brickyard, Ipswich. (*Prehistoric Society of East Anglia*)

Scale, $\frac{2}{3}$

Armstrong now ascribes this submergence to the existence of Lake Humber, a glacial lake, little known in detail, but demanded by the presence of continuous ice off the

east coast of England from Northumberland to East Anglia. That the lake had two periods of existence is

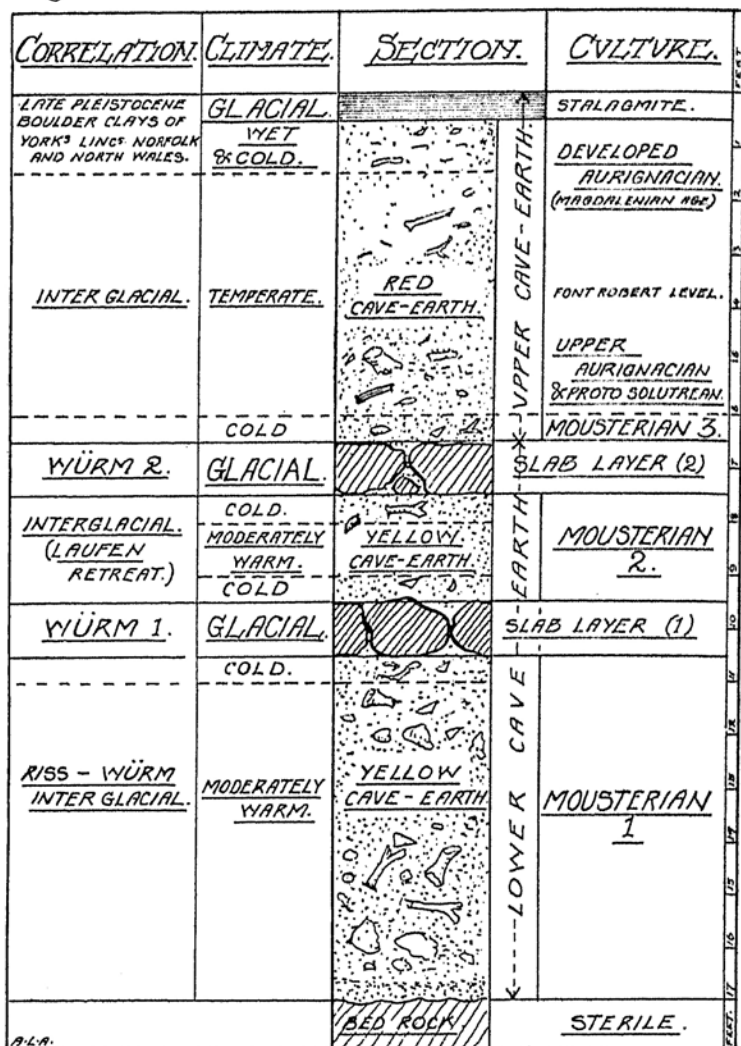


Fig. 63. Typical Section of Pin Hole Cave, Creswell.
(After Leslie Armstrong)

indicated by the two erosion benches, one at each glacial slab-layer, and the presence of fish remains in Mousterian

(2) and (3) indicates that man occupied the caves before the complete disappearance of the lake. The conditions are somewhat similar to those under which Late Palaeolithic Man occupied Gamble's Cave in Kenya, close to the retreating waters of the Gamblian Lake.

Mousterian implements have also been obtained from Kent's Cavern, near Torquay, the Cave of Paviland, South Wales, and the caves of St. Brelade's Bay, in Jersey. The latter caves were, according to Mourant, formed during 60-ft. beach times, but, of course, occupied at some later date. Mourant thinks not very much later, since there is only 6 in. of barren debris between the marine deposits at the base of the cave and the Mousterian culture layer. We have already seen that the Thames was 50 ft. above its present level in Mousterian times (p. 97) so this may be the same period of high sea-level, the difference being accounted for by the greater range of the tides in the Channel Islands.

THE YOUNGER PALAEOLITHIC OF GREAT BRITAIN

The succession of Aurignacian, Proto-Solutrean and Neolithic found by Mr. Reid Moir in the open in Messrs. Bolton's brickyards near Ipswich has been referred to on p. 115. Other finds in the open are known, but, on account of the tendency of the same forms to be reproduced in the Neolithic, they are always rather suspect, and exact typology is necessary for their identification. More satisfaction is obtained from the caves, where, under modern methods of excavation, an exact stratigraphy can be evolved.

In the famous Kent's Hole, excavated by Pengelly, however, owing to the methods employed, which were careful enough in their way, though ill designed for the purpose, considerable mixing occurred. Miss Dorothy

Garrod (1926) has attempted to sort out the layers. Some deposits at the base, which had apparently been washed in, yielded a Chellean implement. Above this was Mousterian, with well-made side-scrapers and some hand-axes. Then came Middle Aurignacian, with typical nosed scrapers and a bone pin; then a series of Proto-Solutrean points worked on both sides; and, finally, Magdalenian with typical harpoons mixed with end-scrapers and La Gravette blades. These latter have blunted backs and show in some instances a tendency towards trapezoidal form. The implements of bone and reindeer antler are typically Magdalenian.

The Cave of Paviland on the south coast of the Gower Peninsula was in 1912 carefully explored by Sollas, but the deposits were found to be much disturbed. It opens on the sea-coast about 30 ft. above high-water mark. There appear to have been marine sands and gravels at the base. At least four series of implements can be separated typologically—namely, Mousterian, Middle and Upper Aurignacian, and Final Aurignacian of the type of Font-Robert. Many of the Mousterian types had apparently been retouched in Aurignacian times, but Professor Sollas thinks a Mousterian layer was once present.

The implements from the cave are in the main Aurignacian, but the leading types of the Lower Aurignacian, the Audi and Chatelperron points are absent.

The Middle Aurignacian with its keeled and nosed scrapers was typical and abundant, and the Upper Aurignacian has La Gravette points with a tendency to trapezoidal form, as in Kent's Cavern, as well as Font-Robert points with pedunculated base. Many fragments of ivory in a highly perished condition were found, including amulets, awls, spatulas and perforated teeth.

A skeleton, the 'Red Lady of Paviland,' whose bones were covered with ochre, was found by Buckland. It had decorations of shell and ivory necklaces, but, according to expert opinion, was really that of a young man.

Among the many other caves cited by Miss Garrod as containing Upper Palaeolithic remains, we may mention Avelin's Hole in Burrington Coombe in the Mendips, excavated in the main by Mr. J. A. Davies. The flint implements were all of Upper Aurignacian type, with La Gravette backed blades, often with microlithic tendencies, but there occurred also a Magdalenian harpoon identical with one described from Goyet in Belgium, and thus indicating a close connection with the Continent.

The caves of Cae Gwyn and Ffynnon Bueno in the Vale of Clwyd in North Wales present an interesting problem in glaciology, since the breccia in Cae Gwyn, in which was found a beautifully worked end-scraper of Aurignacian type, was seen throughout the cave to be overlain by laminated clay and traced at one of the entrances beneath Glacial drift. There seems to be little doubt about this, as the matter was the subject of acute controversy at the time of its discovery, since it implied that man was Preglacial. Of course, such a question does not concern us any longer. Man has been abundantly proved to be both Interglacial and Preglacial, but, on account of the seriousness with which the matter was then regarded, we have not only the opinion of the discoverer, Dr. Hicks, but Sir William Boyd Dawkins and Sir Archibald Geikie were both called in and confirmed the fact that Glacial drift of northern type overlay the implement. Unless some great mistake has been made, we have thus a Post-Aurignacian glaciation of the north of the Vale of Clwyd. Of course, on this side of England we are much nearer the areas of really recent drifts than is

the case with northern Norfolk, and it is conceivable that the combined ice-sheets from the Lake District, the Southern Uplands and possibly Northern Ireland sent a tongue south along the smooth bottom of the Irish Sea as far as North Wales.

In possible confirmation of this, there seems some evidence that an ice-sheet reached the Victoria Cave near Settle in West Yorkshire in Magdalenian times, since that cave has yielded several rods of reindeer antler which are clearly of Magdalenian type, and one of these was noted by Breuil to have adhering to it a sticky grey clay, very similar to the laminated Glacial clay by which the Interglacial fauna containing *Elephas antiquus*, *Rhinoceros leptorhinus* and *Hippopotamus* was sealed down. Above this lay an upper cave earth with Azilian bone implements, including a harpoon, which Mr. J. W. Jackson now holds to be of red-deer antler and not reindeer, as formerly supposed. Glaciers which reached Settle from the Lake District may well have come as far south as Wales.

The most exhaustively studied Upper Palaeolithic succession in England is, however, that of Mother Grundy's Parlour and the Pin Hole Cave in Creswell Crags, Derbyshire. The section of the Pin Hole Cave is shown in Fig 63. Here the beds containing Mousterian 3 merge upwards into others containing Upper Aurignacian and Proto-Solutrean implements. These in turn give place to those of Font-Robert type with pedunculated points and, finally, to a developed Aurignacian, supposed on account of its cold fauna to be of Magdalenian age. The stalagmite at the top of this contains truly Arctic animals including reindeer, Arctic fox and Arctic hare. In Mother Grundy's Parlour, adjoining, the development upwards of this industry continues with increasing content of microliths until it

becomes almost pure Tardenoisian in its upper layers, which yield the typical Tardenoisian burin.

THE EPI-PALAEOLITHIC OR MESOLITHIC OF GREAT BRITAIN

The Stone Age cultures which followed upon the return to normal climatic conditions in Great Britain have been to some extent referred to in Chapter IX. The most widely developed is the Tardenoisian, which we have just seen appears to develop from the evolved Aurignacian of Mother Grundy's Parlour, Creswell Crag, Derbyshire. The sites are mostly on the surface and have generally been found on high or sandy ground, but Mr. Leslie Armstrong informs me that this is not always the case, and he thinks perhaps that on clay land they may be more difficult to detect, having been incorporated with the soil by various agricultural processes. On account of the small size of the implements, this is exceedingly likely.

The Azilian culture of the north-west and the Maglemosian of the east have been referred to in Chapter IX, as have the implements found in the so-called '25-ft. beach,' which are Azilian in West Scotland and Proto-Neolithic in the counties of Down and Cumberland. There is, however, another series of implements which have been obtained from the same beach in an intermediate position—namely, at Campbeltown in Argyll. These, according to the Abbé Breuil, are Palaeolithic in type and recall certain forms from Creswell Crag. There are Chatelperron and La Gravette points, end-scrapers, blades brought to a point at the end by secondary working, a crescent and numerous cores. However, if this actually is the 25-ft. beach, and I see no reason at present to doubt it, these implements cannot be true Palaeolithic.

They must be later than the Azilian of Scotland and a little earlier than the Proto-Neolithic (?late Maglemosian) of Northern Ireland. They demand further investigation both as regards provenance and typology.

Some of Miss Garrod's general conclusions may well be quoted here, since she has made an exhaustive survey of the somewhat scanty Late Palaeolithic industries of Great Britain. She regards this country as the *Ultima Thule* of Upper Palaeolithic Europe, bounded by the great ice-sheet under which Scotland and Ireland still lay buried. The Middle or typical Aurignacian does not differ essentially from that of France or Belgium. In the Upper Aurignacian, however, a local facies appears in the shape of semi-geometrical forms, derivations of the Gravette point, of which the most characteristic is an elongated trapeze. At the same time appears the Proto-Solutrean point, retouched on the bulbar face, which is characteristic of the Font-Robert level, at the end of the Aurignacian on the Continent. The fact that Solutrean laurel-leaves are only known in the south-east of England suggests that this Proto-Solutrean replaces them. 'This,' according to Miss Garrod, 'is what we should expect, since the Solutrean influence in western Europe affects a comparatively small area, and the appearance towards the end of the period of three well-defined provinces in Catalonia, Cantabria, and Central France, each with highly specialised local forms, suggests either that communication was restricted or that the episode was of comparatively short duration.'

Magdalenian influence in England appears to have been slight, and, according to Mr. Burkitt, was limited to occasional expeditions to the south-west of the country (Avelin's Hole and Kent's Cavern). It apparently, however, reached as far north as Victoria Cave in West

Yorkshire, where bone-work of Magdalenian type has been found. Instead, there appears to be a developed Upper Aurignacian industry similar to that investigated by Mr. Armstrong in Creswell Crags. Analogous development independent of Magdalenian influence is found in the caves of Mentone in Northern Italy and Martinrive, near Liège in Belgium. The analogy with Mentone is especially good, since there, as in Creswell, an industry with shouldered points (Font-Robert) passes up almost directly into Azilio-Tardenoisian. Still, the finding of engraved bone and ivory in Creswell shows a certain amount of Magdalenian influence, and the Black Band of Kent's Cavern is undoubtedly Magdalenian.

The study of these local variations is a fruitful line of research, for, although it tends to show that there is a limit to the possibilities of correlation, it brings into view the most engaging problems of source and migration.

CHAPTER XII

ZONING AND CORRELATION

IN the early days of palaeontology, some half-century or more ago, the great Thomas Huxley introduced into that science the concept of homotaxis which, expressed in plain English, is simply the idea that the evolution of similar forms did not take place everywhere simultaneously, but that the same form might be reached in different places and at different times by much the same steps. A similar idea is at the present day permeating archaeology and appears to be causing much discouragement to the workers in that subject. From a world-wide point of view, it is so obviously true as to be hardly worth discussing, but the pessimism regarding its effects in either realm is scarcely justified. As a worker on the zonal side of palaeontology the writer has been repeatedly surprised by the unexpectedly wide range of the zonal fossils with which he has had to deal, and feels that, if the archaeologists will trust their zonal fossils, they will not be led far astray, and that, if they are, the error will soon become apparent. Professor Gordon Childe, in his address to the Prehistoric Society in 1937, has stressed this idea of parallel non-contemporaneous development with special reference to the Neolithic, Bronze and Iron Age cultures, emphasising the fact that the time taken for the spread of a culture may be quite comparable in length to the duration of the culture itself, and, in the relatively short periods assigned to these cultures, this may be essentially true. In the Palaeolithic, however, and even in the

Mesolithic, the ages are longer and evolution slower, so that the time taken for the spread of an industry over a wide area is more likely to be negligible, unless barriers impassable by man intervene to prevent the spread of a culture. Even the geologist does not expect his zone fossils to carry his time-scale all over the world or be completely contemporaneous wherever they occur, but he has as a general rule infinitely greater faith in them than in his stratigraphy. In this he is not just pushing the responsibility on to another science, for he has often been himself the maker and user of the species in which he puts his trust. The writer, therefore, is of opinion that geology, although it provides the rough time-scale on which all others are based, is in detail very unreliable. Many years ago he coined the word 'diachronous' to describe those rare cases in which the stratigraphy could be proved to cross the biological zones, thereby expressing his opinion that the latter gave a more reliable conception of the time-scale. In the same manner, he believes that palaeontology and the typology of man's implements will ultimately give the glacial correlations for which he is seeking. It is really a case of mutual assistance, for the ice ages certainly provide a useful punctuation of the biological and archaeological succession in each region, but geology cannot as yet, by itself, give anything, even in the nature of a partial correlation, between Great Britain, Europe and the Alps, not to mention Africa and America.

While lateral variation is thus a curse to those seeking an easy means of correlation, the time will come when it will provide evidence for many important deductions concerning origins and migrations, things ultimately much more important than any attainment of an absolute time-scale. Archaeology as a science is still in its infancy,

but is advancing with amazing rapidity. Its growing pains are recognisable as such, and need give no distress. Forty years ago the great Carboniferous formation of Europe was palaeontologically almost without subdivision, now it is zoned from top to bottom, with zones, it is true, of varying efficacy and precision, but reaching out in some cases as far as Africa and North America. This is not the performance of biologists and professional palaeontologists, but of the working field geologist and indeed, a fact of which we have every reason to be proud, largely of the amateur. Archaeology is still in the main free from excessive professionalism and its future progress should be untrammelled and rapid.

In drawing analogies between Quaternary zoning and that of the older formations we are, however, at a disadvantage. The means of dispersal are hardly comparable. Marine forms have generally free-swimming larvae. On the other hand, mammals are more mobile. In man's handicraft, however, we have something which need not be carried personally in order to travel. A new invention may be transferred from hand to hand, traded or even captured from an enemy and imitated. Its progress across a continent might therefore be more rapid than the invasion of a new race of men is likely to be. On the other hand, one cannot assume this to be the case. Younger Palaeolithic and Mousterian man lived side by side in East Africa, and did not assimilate one another's cultures, and, according to Peyrony, the Early and Middle Aurignacians lived in adjoining valleys in the Dordogne and did not mix.

Finally, there is one point which as a zonal worker in the geological field I should like to impress on archaeologists. It is the first appearance of a new form that matters. This, in the case of a zone of immigration, is

often rapidly followed by the maximum, after which the form lingers on in gradually diminishing numbers. Only occasionally do we witness the actual evolution of a new form, and in this case it is remarkably difficult to define even its lower limit. Most of the fossils used for zonal purposes belong to the former category.

These principles seem to be equally applicable to archaeology. The simultaneous occurrences in Africa of Mousterian and Younger Palaeolithic indicate that the Mousterian of that country is a survival which lingered on into Font-Robert and Solutrean times, as shown by the presence in the Aterian (or late Mousterian) of the shouldered point and laurel-leaf point. This African Mousterian is finally seen to evolve directly, via the Sebilian of Egypt, into the Capsian industry, which ultimately spread in Mesolithic times over a great part of Europe.

We may fairly assume then that, during the Older Palaeolithic, at a time when, according to Sandford (Chap. XIII), North Africa was well watered and well stocked with animal life, it was every bit as advanced as Europe, but with the Mousterian a change set in, and although Younger Palaeolithic men found their way there, yet they did not succeed in replacing the Mousterian population who lingered on until the beginning of Mesolithic times.

There is, however, a much more pressing and serious problem to be solved nearer home. This is the correlation of the Glacial periods in various countries and the correlation with them of man's industries. Palaeolithic typologists, having discovered that certain of their type implements are either untrustworthy or too long in range, show a disposition at present to call on geology for a time-scale and method of correlation. Glacial geology can

give them several different local time-scales, but no certain correlation between the latter. There are very considerable difficulties in the way of any correlation that has been brought forward. For the understanding of these difficulties very little glaciology is necessary.

The former presence of land ice is commonly recognised by the striation of the rock surface or the presence of boulder clay. Boulder clay is a more or less tenacious clay with striated stones foreign to the district, called 'erratics.' The sheets of boulder clay, with accompanying sand and gravel, which mark the extent of former ice sheets are usually referred to as drift sheets, a relic of the days when they were ascribed to a sea with floating icebergs. The drift sheets of all countries extend one beyond the other in an imbricated series. Thus in the British Isles we have:

- (5) The Youngest Drift, with very fresh topography.
- (4) The Younger Drift, less fresh but with some surface features preserved.
- (3) The upper chalky boulder clay or Little Eastern Glaciation.
- (2) The lower or great chalky boulder clay.
- (1) The North Sea and Oxford Plateau Drift.

The North Sea Drift of Norfolk and Suffolk is everywhere highly weathered and decalcified and separated by a period of deep erosion from (2) The great chalky boulder clay. It overlies the 15-ft. shoreline or *Leda myalis* bed, the Forest Bed and the Stone-bed (Chap. VIII). Mr. Sainty has obtained a Chellean hand-axe from it.¹ No fossils are known from the period of erosion.

¹ I should like to acknowledge here a correction made by Professor Boswell of an error in *The Quaternary Ice Age*, p. 79, where this important implement was stated to have been found in the Norwich brick earth. I should have said 'in the North Sea Till,' as I did on p. 80. The error arose from considering the two deposits as contemporary, as I still do, but I should remark here that Professor Boswell does not seem as confident as Mr. Solomon does, that the basal portion of the Cromer Till should be

No fossils or implements are known from the Great Chalky Boulder Clay, but it underlies a remarkable series of deposits, e.g. Hoxne or Ipswich with Acheulian and Older Mousterian (Clactonian?). High Lodge with advanced Clactonian and Acheulian, and the 100-ft. terrace of the Thames with Clactonian and Acheulian implements.

All these deposits are overlain by the Upper Chalky Boulder Clay of the Little Eastern Glaciation or by periglacial solifluxion deposits of the same date. The question of the identification of the Upper Chalky Boulder Clay, and of the extent of the Little Eastern Glaciation, is in a most unsatisfactory state. It is said to be more richly chalky than the Lower Chalky Boulder Clay, which has much included Jurassic material (Chalky-Jurassic or Chalky-Kimmeridgian) but its limits have not been traced. On the other hand it has never been clearly related to the true Younger Drift, a representative of which, the Hunstanton Boulder Clay, occurs in the low ground of the north-west of Norfolk, where it is not seen in contact with any deposit of the Little Eastern Glaciation. In the Hunstanton Boulder Clay Mr. Reid Moir has found instruments which he considers Aurignacian, but which he admits to be largely Levalloisian in character (*see* p. 143).

In the Baltic Countries and in Germany the imbricated succession is as follows:

- (5) Finiglacial, bounded by the Salpausselkä Moraine.
- (4) Daniglacial, or Weichsel Glaciation, bounded by the Brandenburg Moraine.

correlated with the Norwich brick earth. In view of the controversial nature of the subject it might be wiser to admit that all one can be absolutely sure of is that the Sidestrand implement is older than the Cromer Till, which has been variously correlated with the Great Chalky Boulder Clay or with the Norwich brick earth. It is at any rate older than the Great Chalky Boulder Clay.

- (3) Warthe Glaciation, bounded by the Fläming Moraine.
- (2) Saale Glaciation.
- (1) Elster Glaciation.

The Elster Glaciation is separated from the Saale by a period of great erosion weathering and decalcification. Both Elster and Saale drifts are loess-covered. Only fragmentary terminal moraines of these glaciations are known.

The first consistently developed end-moraine encountered in going north across the German plain is the Fläming moraine which limits the Warthe Glaciation. It is, however, generally considered merely to mark a retreat stage of the Saale Glaciation, although contrary opinions have from time to time been expressed. Outliers of the Loess extend northward to the Fläming Moraine and here and there transgress on to it.

The Weichsel Drift (Daniglacial), limited by the Brandenburg Moraine, is the Newer Drift of Germany *par excellence*. Its topography is everywhere well marked and in excellent preservation. It is comparable in topographic expression with the Youngest Drift of the British Isles and is much fresher than what is commonly known as the Younger Drift (York Moraine). The Finiglacial stage of the Baltic is, in the British Isles, probably entirely confined to mountain regions and expresses itself merely as a corrie and valley glaciation.

The outwash from the Saale Glaciation in the Ruhr District has yielded implements which were called Mousterian by Menzel, but which are probably Levalloisian. Levalloisian flakes have been obtained elsewhere from the outwash of the Saale (Grahmann and Würtschin, 1933). Such implements as have been obtained from the Elster-Saale Interglacial are reputed to be 'Chellean' (Woldstedt, 1935). At Markleeberg, Hundisburg,

Wettin, and Kockstedt Acheulian I and II have been obtained from river gravels beneath the moraine of the Saale Glaciation. Late Magdalenian stations have been found in North Germany on the moraine of the Weichsel Glaciation.

Of archaeologically dated deposits in Germany, the clay of Rabutz with the warm forms *Elephas antiquus* and *Rhinoceros merckii* and Micoquian implements (Werth) rests on the Saale moraine and is thus referable to the Saale-Warthe or Saale-Weichsel Interglacial. The calcareous tufas of Ehringsdorf and Taubach, containing Micoquian implements and a skull of advanced Neanderthal or Galilean type (*see* p. 192), although not dated with reference to a glacial deposit, are therefore referable to the same Interglacial.

In the Alps Penck has distinguished four glaciations. They are, in order of occurrence, Günz, Mindel, Riss and Würm, the last of which has been divided into Würm I and Würm II. This Alpine sequence is better established than that of England and Germany, largely owing to the fact that the outwash fans are readily traceable, stretching down the rivers from the terminal moraines. They are, in the same order, the Older Deckenschotter, the Younger Deckenschotter, the Higher Terrace and the Lower Terrace. Consequently, there is a tendency to take the Alpine chronology as standard and apply its nomenclature to the other glaciations. This, however, is a very dangerous practice and should not be indulged in without the support of palaeontology and archaeology.

The Alps have thus had three interglacial periods, Günz-Mindel, Mindel-Riss and Riss-Würm. By consideration of the erosion which took place between the outwash terraces Penck arrived at the conclusion that the

Mindel-Riss was several times longer than either the Günz-Mindel or Riss-Würm. This is a very important point, because we have seen (Chap. X) that in the Somme and Thames there is a very marked interval between Breuil's Clactonian and Levalloisian Solifluxion. This is the great period of the development of the Acheulian. Owing to the rarity of the Acheulian in Germany, and its replacement on the German side of the Rhine by core and flake industries, archaeological confirmation is lacking.

In the outwash of the Pyrenean glaciers in the south of France, Penck has, however, discriminated the same four fluvio-glacial terraces. The lowest and youngest of these contains remains of the *Elephas primigenius* or mammoth fauna, and can be traced upstream into contact with a moraine. It is therefore glacial in origin and not alluvial, as Obermaier thought. Acheulian implements have been found at Fonsorbes on the Younger Deckenschotter of the above series, and do not encroach on the neighbouring High Terrace Travel. They belong therefore to the Mindel-Riss Interglacial.

In the Saône district of the Alpine Glaciation the Mousterian (Levalloisian) stations with an Arctic fauna and the area of the Riss Glaciation are mutually exclusive. In this valley there is a large area of the Riss Glaciation which has never been covered by the deposits of the Würm. Moreover, this area has plenty of caves which would have formed ideal dwellings for Levalloisian man. Yet his remains are never found within the Riss boundary, whereas they occur in several sites outside it. Penck thus makes Levalloisian man contemporary with the Riss Glaciation, and this agrees with Breuil's interpretation of the Somme (p. 87). The warm Mousterian or Levalloisian Penck places later in the Riss-Würm Interglacial. This is largely on the evidence of

Wildkirchli, a cave in the Alps, at an altitude of 1,500 m., or 300 m. above the snowline of the Würm Ice Age, during which it must have been blocked with snow and ice and so quite uninhabitable by man. This cave, excavated by Emil Bäckler, yielded 1,000 individuals of the cave bear, which indicate a well-stocked hunting ground. The implements are of Mousterian or Levalloisian type and therefore not referable to Postglacial times. The occupation of the cave must clearly have taken place in an Interglacial period. We may therefore conclude that the warm Levalloisian of the Alps was Riss-Würm.

With these short sketches of the glaciation and archaeology of England, Germany and the Alps, we may attempt a correlation. Let us concentrate on the long Acheulian Interglacial and see if we can follow it through. Starting with the Somme (Chap. X), we note that this period embraces the F2 gravels of the 45-m., 30-m. and 15-m. terraces between the S2 and S3 solifluxions of Breuil. In the Thames it embraces the gravels of the 100-ft. terrace which overlies the great chalky boulder clay. The 100-ft. terrace as a matter of fact begins with Clactonian II, which, in the higher levels, is replaced by Acheulian, but the flake industries of the glaciations, according to Breuil, tend to persist into the succeeding Interglacials, so this is to be expected locally. The Interglacial deposits of Hoxne and Ipswich (Chap. XI) are also in the main Acheulian, rest on the Great Chalky Boulder Clay and are overlain by glacial or solifluxion deposits. Both show Levalloisian at the top, and Hoxne has a few Clactonian flakes at the base. The solifluxion is presumably that of the Little Eastern Glaciation.

The gravels of Warren Hill near Mildenhall (Chap. XI) are supposed to be the outwash gravels of this latter glaciation. As such they yield implements of all former

periods in rolled condition. The less-rolled specimens are Acheulian of a fairly advanced type. Very few Early Acheulian implements occurred, a fact which Dr. Solomon ascribes to the district being under the sea-level of 100-ft.-terrace times. Clactonian implements occur, but there is not a single flake of Levalloisian type, the latest industry being pure advanced Acheulian.

At High Lodge, Mildenhall, the Interglacial deposits occur between two boulder clays, the lower being the great chalky and the upper presumably that of the Little Eastern Glaciation. Clactonian occurs at the base and is followed by Acheulian and finally by Levalloisian. We seem to be dealing here with the same Interglacial.

Passing north into Lincolnshire we have the famous marine Interglacial beds of Kirmington at 100 ft. above sea-level. Here Mr. Burchell has found rather crude Clactonian flakes in the gravel underlying the raised beach and estuarine beds, indicating that the preceding glaciation is of that archaeological date, and, in the raised beach itself, a single flake which he considers to be Levalloisian. This flake has a faceted striking platform, but is very rough with much cortex remaining. The striking platform has only two facets and this might easily happen in a Clactonian implement. However, as Levalloisian appears at the top of High Lodge there seems no reason why Kirmington should not belong to the same Clactonian-Acheulian Interglacial.

In the Vale of York Mr. Wilfrid Edwards has recently described a shoreline at 100 ft., which, when traced north, stops at the Eskrick (York) Moraine. It is unfossiliferous, as one would expect in such an enclosed estuary, but seems to be equivalent to the 100-ft. terrace of the Thames. If so the drift which terminates in the York Moraine is the equivalent of the Little Eastern—

that is to say, the next glaciation after the Acheulian Interglacial. It is, however, what is commonly known as the Younger Drift. Its margin has been traced by Kendall in the Cleveland Hills, by Raistrick in the Vale of York, by Jowett and Charlesworth on the west side of the Pennines and by Wills in North Shropshire. In the Severn valley, according to the latter, it has a distinct outwash terrace, the main terrace of the Severn. This can be traced down the Severn and thence up the Avon. In the latter river are two older terraces with warm fauna, and the lower of these has yielded a single Acheulian implement. These older terraces, when traced downstream to the Severn Estuary, have approximate levels of 65 ft. and 110 ft.¹ in that portion of the river which is controlled by sea-level. We seem to be back at the Acheulean 100-ft. and 50-ft. terraces once more. Thus we see that the so-called Younger Drift of Northern England is really the equivalent of the Little Eastern of Norfolk and Suffolk.

Now, turning to the Continent, we find (p. 136) that the glaciation which follows the Acheulian Interglacial is the Saale. In its outwash are Levalloisian implements. It is Breuil's Levalloisian Glaciation, and, by the above showing, must be the equivalent of the Little Eastern and 'Younger Glaciation' of England.

Now, the Riss Glaciation of the Alps (p. 23) is also Levalloisian. Moreover, the Riss Glaciation of the Pyrenees (p. 138) is Post-Acheulian, hence we have:

Little Eastern = Saale = Riss = Breuil's Levalloisian Solifluxion.

¹ For an alternative interpretation of sea-levels see Wills 1938, p. 223. The levels quoted are those of the surfaces of the terraces at the Severn Tunnel. From the level, 35 ft., of the shelf of erosion at the base of the inferior terrace and the gradient of the terraces Wills deduces a lower base-line further seaward. The shelf of erosion may however, as in the Somme, be much older than the terrace deposits resting on it. (See p. 89).

Moreover, the character of the drift is in conformity with this correlation. The Younger Drift of England, which we have correlated with the Little Eastern, has suffered much denudation, which is clearly not entirely Postglacial. In the preservation of surface features, it will not bear comparison either with the Younger Drift of Germany, the Weichsel, or with the Youngest Drift of Western Ireland. Its drainage is mature and complete. There are no undrained hollows and no unsilted lakes, except such as are due to recent subsidence. Undrained hollows and unsilted lakes abound on the Weichsel Drift of Germany and on the Youngest Drift of Western Ireland.

Finally, both the Younger Drift of England and the Saale Drift of Germany show, where fully developed and preserved, a definite tripartite subdivision, with three boulder clays and two intervening sands. This characteristic is, as far as known, not borne by any other drift either earlier or later.

Now, there is one snag in this otherwise apparently perfect correlation. It is the reported discovery of Late Palaeolithic implements in the Younger Drift, whereas the Upper Chalky Boulder clay of East Anglia contains Older Mousterian which in to-day's classification would no doubt be called Levalloisian (or Clactonian). If we admit that these implements of Aurignacian type are actually *in situ* in the Younger Drift, we must regard the later Aurignacio-Magdalenian Glaciation as approximately co-extensive with the Levalloisian Glaciation which preceded it, for the Hunstanton boulder clay in which they occur is actually on the shores of the Wash, and there is a further occurrence in the Vale of Clwyd in North Wales of a cave with Aurignacian implements supposed to be sealed by Younger Drift.

At the start, let it be said that Mr. Reid Moir's discovery of the occurrence of 'Older Mousterian' points and scrapers in the upper chalky boulder clay of Suffolk is above all question. The implements were extracted from the sections in many instances by the finder himself and from considerable depths in the boulder clay. Depths of 8 ft. and 25 ft. are cited. They are obviously either Clactonian or Levalloisian in type. Some at least of the butts are unfacetted.

Mr. Reid Moir's discoveries in the Hunstanton boulder clay of north-west Norfolk are somewhat less well substantiated. In the first place, a mixture of Levalloisian and Late Palaeolithic forms has been found, which is, of course, not impossible, since the implements must be in any case derived. One cannot be sure that the boulder clay is not rearranged. The present writer has got so used to the evidence of extensive rearrangement by soil-creep and hill-wash in the Younger Drifts of Northern England that he is suspicious regarding all sections less than 6 ft. deep. Lamplugh cites 3 ft. to 5 ft., and even more, in one of the Hunstanton Sections (Gas Works), which he regards as rain-wash. Mr. Reid Moir only gives the depth from the surface in one instance. This is a small discoid biface which was found at a depth of 6 ft. in South Hunstanton. It may well be of 'Mousterian' Age. In the case of the implements of Younger Palaeolithic type, no depths appear to be given and it is, moreover, stated that the bulk of the finds were made in the upper pebbly portions of the sections. In a later paper, Mr. Reid Moir emphasises the dominantly 'Mousterian' character of his more recent finds, and, in view of the extraordinary difficulty experienced by glacial geologists in distinguishing a rearranged boulder clay from one *in situ*, he will excuse the suggestion

that possibly the Younger Palaeolithic element in his Hunstanton finds may have come from rearranged boulder clay on the surface.

At any rate, the implements found by Mr. Burchell at the base of and in the upper Hessle clay at Flamborough Head in Yorkshire are 'Mousterian' or Levalloisian in type, and contain no Younger Palaeolithic element. This clay has also been claimed to be *remanié*, but it is to be noted that Mr. Bisat considers it as *in situ* and representing a minor glacial invasion at the end of the series of East Yorkshire glacial episodes.

There is thus a very considerable weight of evidence that the upper brown boulder clay or upper Hessle clay of the east coast of England is Levalloisian or Post-Levalloisian in age.

As regards the Younger Palaeolithic implements of North Wales, which occur in a cave reported to have been sealed up by northern drift, there has been much controversy among geologists, some of whom regarded the sealing drift as *remanié*. If, as has been the tendency in recent years, we admit the drift to be *in situ*, we must suppose the Irish Sea Basin to have been filled with ice during the Magdalenian period—that is to say, at a much later date than that to which we have ascribed the Younger Drift of Cheshire. It is clearly impossible to check up evidence which was adduced and destroyed fifty years ago, at a date when its significance was not thoroughly understood.

The writer has up to the present never ventured to publish a correlation table. He now puts the following forward as it appears to have a new basis. It has its main prop in the centre instead of at the ends, in the Levalloisian Glaciation and the preceding Acheulian Interglacial.

LM

<i>France</i>	<i>England</i>	<i>Germany</i>	<i>Alps</i>	<i>Elephants</i>
Levallois-Magdalenian solifluxions and loess.	Youngest Drift.	Weichsel.	Würm { II I	<i>E. primigenius</i>
Micoquian Interglacial.	No known deposit.	Interglacial.	Riss-Würm.	<i>E. antiquus.</i>
Levallois solifluxion— Older loess.	Little Eastern, York Moraine—Younger Drift ('Tripartite').	Saale (Tripartite).	Riss.	<i>E. primigenius.</i>
Acheulian Interglacial.	100-ft. terrace. Hoxne. Kirmington.	Interglacial.	Mindel-Riss (Long).	<i>E. antiquus.</i>
Clactonian solifluxion.	Great Eastern.	Elster.	Mindel.	

CHAPTER XIII

EGYPT, NORTH AFRICA AND KENYA

EGYPT, the cradle of historic civilisation, appears during the Palaeolithic to have been a land flowing with milk and honey. Encircled from the end of this period to the present day with deserts 'which serve it in the office of a wall,' it has been happily sheltered from the inroads of its more barbaric neighbours. It has required the growth of rival civilisations more forceful if not more cultured than itself to break its long periods of peaceful development. In Palaeolithic times the régime was profoundly different. Extensive areas beyond the narrow ribbon of irrigated land were then the haunts of man and the larger mammals. The deserted *wadis* which descend from the plateau on every side were occupied by powerful streams, and man seems to have had little difficulty of access. The story as known to us is largely that of the Nile Valley itself and of the great oases. These, however, have of recent years been made the subject of extensive studies in which the succession of cultures is intercalated in a stratigraphy of exceptional clearness.

Curiously enough, this stratigraphy has a different basis in the three great areas which have been at all thoroughly investigated. In the Nile Valley the researches of Sandford and Arkell have shown a succession of river terraces remarkably similar to those of the Somme and the Thames and characterised by equivalent industries. In the Faiyum, a desert depression some 50 miles

to the south-west of Cairo, now below sea-level and irrigated from the Nile, Miss Caton Thompson, Miss Gardiner, Sandford and Arkell have traced the shorelines of former lakes each marked by its appropriate industry, and the two first-named investigators have elaborated in the Kharga Oasis, 300 miles further south, a stratigraphy based on tufas, and silts, the product of local springs. In all three districts the sequence of industries is remarkably similar and for clearness may be stated here in tabular form:

Neolithic (Badarian and Tasian).	
Capsian (Tardenoisian).	
Sebilian	} Younger Palaeolithic.
Aterian or pre-Sebilian	
Levalloisian or Mousterian.	Middle Palaeolithic.
Acheulian.	Older Palaeolithic.

The Neolithic has been long known. It is definitely a culture of the dawn of history immediately antedating the Pre-Dynastic period, and, compared to the other flint industries of Egypt, is a product of relatively modern times. Pottery and agriculture have definitely made their appearance.

The Capsian has the usual microlithic character. The Sebilian is an industry of Middle Palaeolithic facies with Capsian or microlithic tendencies. It was first described by Vignard from the Kom Ombo plain near Thebes. The Aterian, or pre-Sebilian of Miss Caton Thompson, is an industry of Levalloisian (Mousterian *s.l.*) type with the addition of the tanged point and the laurel-leaf point. It thus shows definite Late Palaeolithic characters and may be transitional or a survival. The Levalloisian and Acheulian resemble very closely the similarly named industries of Europe.

THE KHARGA OASIS

Let us take first the Kharga Oasis because of its ample and well-characterised industries. It lies about 100 miles west of the Nile in a basin flanked on all sides by inward-facing escarpments. The stratigraphy shows three tufas, a plateau tufa and two *wadi* tufas; also three gravels, the plateau gravels, the terrace gravels and the *wadi* gravels. The latter are all archaeologically dated and the history of the region is as follows:

- (1) The plateau tufa, massive, crystalline, with reed impressions but no other fossils. Plio-Pleistocene.
- (2) A period of great erosion.
- (3) The filling of the valleys thus formed with angular breccia, still unfossiliferous. Dry.
- (4) A rainy period and the formation in the valleys of the first cellular *wadi* tufas, which rest on the breccia. Fossil leaves, land shells, and unrolled Acheulian tools. The plateau gravels, also with Acheulian implements, were formed at this stage. Rainy.
- (5) Erosion of the plateau gravels in broad and shallow valleys and the spreading out of the material at a lower level in a secondary sheet called the 'Exogyra gravels.' These contain a mixed Acheulian and Levalloisian industry.
- (6) The formation of another *wadi* tufa overlying silts and gravels. These tufas are dated by the occurrence of floors of tools beneath them. The implements are in the main the products of a tortoise-core industry of Levalloisian or Mousterian *s.l.* type. Miss Caton Thompson calls it Pre-Sebilian since it contains many implements unrecognised in normal Mousterian, including the tanged point and the laurel-leaf point. It appears to be what is elsewhere termed 'Aterian.' These deposits were produced by the ponding of the main valleys by boulder-barrages. Rainfall decreasing.
- (7) No further tufa formation, but erosion of narrow channels in the floors of the old mature valleys. Formation of gravel terraces at 7 m. and 5 m. above present *wadi* level. In the gravels of the upper terrace were pre-Sebilian implements and

on its surface an Aterian flaking site. The lower terrace was barren. Miss Caton Thompson thinks a lower Upper Palaeolithic date for the Aterian is indicated.

- (8) The next records are on the Libyan Plateau where sites of Capsian and Capso-Tardenoisian age occur around or buried in the silts of shallow clay pans.

The spring deposits of the floor of the depression have yielded some remarkable sites. These deposits form mounds protected by a sandrock covering, which appears to have been the last product of all dying springs in the oasis. It is an air-borne sand cemented by the siliceous waters of the spring.

A collection of 500 Acheulian hand-axes was found with an attendant flake industry on the bed-rock beneath such spring deposits. The hand-axes were mostly lanceolate, but cordate and ovate forms were included. The intentional choice of nodules of waisted outline is obvious, and in other cases definite bilateral hafting notches are conspicuous. It thus looks as if at least some types of *coup-de-poing* were hafted. The flake industry to which Miss Caton Thompson in her first communication gives no name is apparently Clactonian; at any rate no striking platforms are faceted and no tortoise-cores are present. Aterian tools lay on the surface of the spring deposit. Miss Caton Thompson refers the Acheulian spring deposit to episode 4 above. An Aterian culture is connected with the penultimate stage of one of the spring deposits, being sealed over by sandrock of aeolian origin. At another locality a Capso-Tardenoisian site was found resting on the sandrock. Evidently the formation of dune-sand had begun during or before the Capsian. Ostrich egg-shell ornaments were characteristic of this industry. Beautiful Neolithic implements of Badarian type are found in the desert between Kharga and the Nile.

THE NILE

The story of Palaeolithic Man in the Nile Valley is a story of river terraces very similar to that of the Somme and the Thames (Chap. X). We must not, of course, expect absolute similarity, since the conditions are essentially different. There is, for instance, no solifluxion and no loess, and the response to changes of sea-level is modified by the length of the river. It is remarkable, however, that there are two higher terraces, a 100-ft. and a 50-ft., both of Acheulian age, with associated flake implements of Clactonian type, not, however, as in the Thames, segregated in a separate bed.

Since terraces are only controlled by sea-level at the mouth of a river, and not higher up, the actual surface of the Nile alluvium is taken as a reference-level, and it is found that the 100-ft. and 50-ft. terraces show a remarkable parallelism with the present thalweg, maintaining throughout the length of the valley these same heights above the recent alluvial plain. This is in itself a remarkable fact and indicates maturity of development in Acheulian and modern times.

The later, Middle Palaeolithic history of the river is shown by lower, less well-preserved terraces at 25 ft. to 30 ft. and 10 ft. to 15 ft. above the alluvium. These are slightly irregular, and perhaps less well known. By far the most interesting development, however, took place in Later Palaeolithic times, when gravel production ceased and a cone or sheet of silt descended from the south, filling in the mouths of the tributary *wadis*, down which the gravel of the terraces originally came. Obviously there had intervened a great change of climate sufficient to deprive the plateaux adjoining the Nile of the major part of their rainfall. The gradient of this

cone is considerably greater than that of the modern Nile, to the alluvial level of which it descends near Luxor.

The scheme of development, which has been thoroughly investigated throughout Egypt by Messrs. Sandford and Arkell, is thus as follows:

Lower Palaeolithic	{	100-ft. terrace. . . .	{ Primitive Chellean, Chellean, Older Acheulian and primitive core and flake industry.
		50-ft. terrace.	Evolved Acheulian.
Middle Palaeolithic	{	25-30-ft. terrace. . . .	Early Mousterian.
		10-15-ft. terrace. . . .	Simple and evolved Mousterian.
Late Palaeolithic	{	Silt Cone. 100 ft. to below alluvium . . .	Sebilian (<i>see</i> p. 155).

The implements from the gravels of the 100-ft. terrace are the oldest yet known in Egypt. The same types occur throughout its length. They cover a long period of time and much evolution, ranging from the earliest Chellean or Abbevillian types to crude Acheulian, with a slight admixture of flakes suggesting early Clactonian. A few of the bifaces are of triangular cross-section suggesting the early forms described by Reid Moir from East Anglia, which are supposed to be developed from the rostro-carinate form (*see* p. 41). Others are roughly hewn ovates. Most of them have portions of the original surface of the pebble from which they were hewn remaining at the butt end, a few have lateral notches as if for hafting as in the Kharga Oasis. A unique specimen is pick-shaped.

The implements from the 50-ft. terrace mark the culmination of Acheulian technique in Egypt. They are in considerable variety. All forms of the 100-ft. appear again, but in a rolled condition, obviously derived.

Among the instruments of the same age as the gravel are pointed *coups-de-poing*, ovates and discs. The outer surface of the flint is still present in some instances, but in others completely removed. The working of the point is sometimes very delicate, and, where the butt is entirely reworked, it takes a characteristically Acheulian semi-circular outline. The ovate implements and discs are also characteristically Acheulian. The twisted ovate, however, does not occur.

The 30-ft. terrace of the Middle Palaeolithic contains remarkably few signs of contemporary man. There are many derived implements. Such new forms as occur, however, are core-and-flake instruments of 'Mousterian' plan. Sandford compares these to the flake industry at Swanscombe in the Thames Valley, but emphasises that the striking platform is often faceted. The flaking angle is 105 degrees to 110 degrees. Sandford says 'the arrival of a core-and-flake industry distinct from the Clactonian in the Nile Valley at this stage may be regarded as an important point of Palaeolithic chronology and potential association with Europe.'

In the 15-ft. terrace the cores are lighter and the striking platforms more carefully prepared, but show a transition to the coarser earlier type. Cores of sharply triangular type and triangular flakes are common. With this development the series of implements found *in situ* in the 10-15-ft. gravels of Upper Egypt comes to an end. On the surface of the terrace, however, still more advanced 'Mousterian' types are found. In the south these occur at the bottom of the late Mousterian-Sebilian silt, and in the north they have been found in the 25-ft. Nile gravels and in the 112-ft. (Mousterian) beach of the Faiyum. Their absence in the intermediate area is apparently ill understood. Double-ended cores with two

prepared striking platforms at opposite ends occur in the Mousterian lake deposits of the Faiyum and the adjacent 25-ft. gravels of the Nile Valley. Later they became a common type, on a smaller scale, as the industry developed into the form known as Lower Sebilian. These somewhat complex relations, according to Sandford, indicate that chronological distinctions may ultimately be made in the 10-25-ft. gravels of the Nile. The 10-25-ft. gravels contain the typical Mousterian of Egypt, the 30-ft. gravels are Early Mousterian.

Finally, the silts of the south begin in late Mousterian times and end in the Sebilian, or Late Palaeolithic. The Sebilian, first described by E. Vignard from the Kom Ombo Plain, is Mousterian by its discs and its small Levalloisian and other flakes with retouch of the striking platform. It is, however, Younger Palaeolithic by its grattoirs and large blades with blunted backs. In Sebilian II a technique of removing the heel or bulb of percussion, by laying the blade flat and striking a blow perpendicular to its length (chopping), is introduced, and Sebilian III is markedly microlithic. The Sebilian is evidently the Younger Palaeolithic of Egypt, and the Mousterian element in it is a survival. Sebilian III is probably Tardenoisian or Mesolithic in age (Sandford, 1934).

THE FAIYUM

The lowest point in the Faiyum is 147 feet below sea-level. It is irrigated from the Nile, which also maintains a small lake, the Birket-el-Quarum, in the bottom of the depression. There has been much controversy as to the date of its excavation. According to Sandford, it was non-existent in the Pliocene, and there is no doubt at all that a depression already existed to harbour a large lake

in Mousterian times. Miss Gardiner ascribes its formation to wind erosion in a desert climate, and for this purpose requires a pre-Mousterian dry period. Sandford maintains that there is no independent evidence of this, and thinks the excavation is due to normal water erosion, which was continued below sea-level in the central part of the basin in Sebilian times, when the Nile and Mediterranean admittedly were very low.

No Lower Palaeolithic beds are known in the Faiyum. As far as negative evidence goes, this would seem to

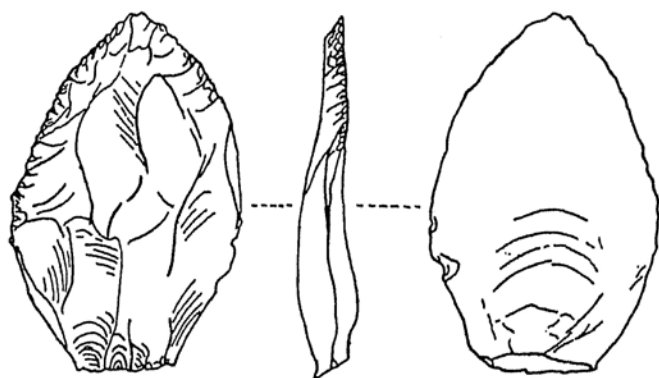


Fig. 64. Retouched Mousterian Flake from the 112-ft. Beach of the Faiyum. (After Sandford)

Scale, $\frac{2}{3}$

indicate that there was no lake at this period. The earliest shoreline in the basin is that of Late Mousterian age, 112 ft. above sea-level, discovered by Sandford and Arkell (1929). Even this does not contain derived Lower Palaeolithic or Lower Mousterian implements. It yields, however, a definitely Late Mousterian industry (Figs. 64, 65) with Sebilian tendencies. The cores form a series from triangular to discord, and the flakes, which are rarer, occasionally show beautiful secondary working. Double-ended cores with prepared platforms,

so that a flake can be struck from either end, are quite common.

The 112-ft. Mousterian beach of the Faiyum, which in the east threw its shingle 15 ft. higher in the form of storm beaches, can be traced as a 20-ft. terrace through the Hawara Channel into the Nile Valley, and shows throughout a similar suite of implements. The drop from the Nile to the lake was about 5 ft., so low a gradient that it

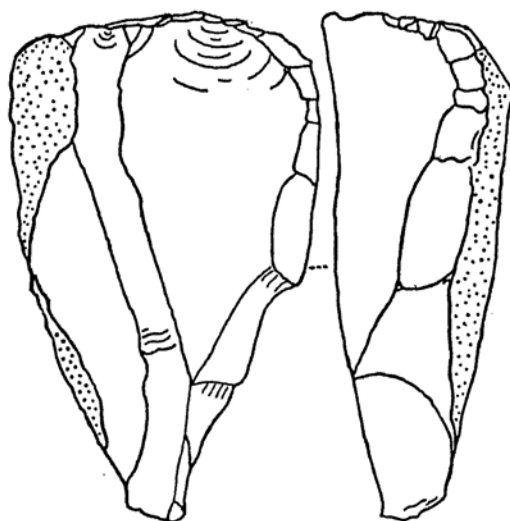


Fig. 65. Mousterian Core from the 112-ft. Beach of the Faiyum. (After Sandford)

Scale, $\frac{3}{8}$

is possible that the flow was reversed at seasons of low Nile.

Below the Mousterian beach of the Faiyum Lake is a series of terraces as yet only observed in one locality. They occur at 101, 99, 96, 92, 89, 86, 78, 75 and 72 ft. respectively. They show continuous recession of the lake level. That at 92 ft. is important, being traceable over a considerable area and containing Sebilian implements (Figs. 66, 67). The Sebilian is the Late Palaeolithic

industry of Egypt, and, according to M. E. Vignard, who first described it from the Kom Ombo Plain, between Edfu and Assuan, is developed directly from the Mousterian. He distinguishes three stages, Sebilian I, II and



Fig. 66. Late Palaeolithic (Sebilian) Flakes from the 92-ft. Beach of the Faiyum. (After Sandford)

Scale, $\frac{3}{8}$

III. Sebilian III is definitely Tardenoisian, with geometric microliths. The rather monotonous industry of the 92-ft. and 75-ft. shores of the Faiyum Sandford and Arkell ascribe to Sebilian I and II. Double-ended cores, similar in miniature to those of the Late Mousterian, but

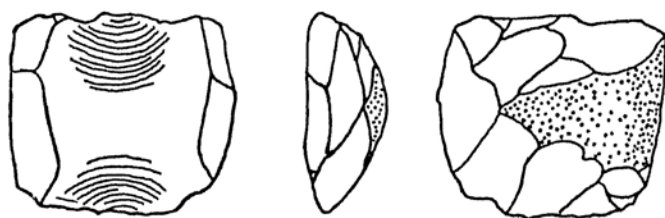


Fig. 67. Sebilian Double-ended Core from the 92-ft. Beach of the Faiyum. (After Sandford)

Scale, $\frac{3}{8}$

squarer and more regular, are very common. Similar types occur in Sebilian II at Kom Ombo. The flakes are either parallel-sided or else miniature Mousterian points. They are traceable in the Hawara Channel, and are identical with those of the silts of Upper Egypt, but are not known from Lower Egypt, where the deposits containing them probably lie below the level of the

alluvium. No Upper Sebilian (Tardenoisian) industry has been found, but the rare implements associated with the 75-ft. level (see above) are smaller.

Lower shores than that at 75 ft. are concealed in the east beneath alluvium, but, beyond the limits of the latter, Miss Caton Thompson and Miss Gardiner have investigated a lower beach at 57 ft. This is the Neolithic shoreline. It is not in the series of dropping levels detailed above, but is separated from them by a great period of denudation, during which the lake probably disappeared altogether, and its deposits were profoundly denuded. Sandford and Arkell ascribe this to denudation by the Faiyum streams, which escaped to a low Nile through the Hawara Channel, and they consider the basin was cut to its lowest level at this period. Miss Gardiner, however, considers it to be the effect of wind erosion in a desert climate, just as she thinks the earlier excavation of the Mousterian basin is due to the same cause. All are agreed that the Neolithic lake was fed from the Nile. Decadent Neolithic industries are associated with lower shorelines down to 7 ft. below sea-level, after which we pass into Dynastic times. The present lake is 147 ft. below the sea.

The complex stories of oscillating sea-level recently elaborated in the Somme and Thames (*see* Chap. X) make one wonder if that of the Nile is not equally complex. It is a question of how many periods of low-base level can be detected. One in the Younger Palaeolithic is universally admitted, and Sandford makes the Late Mousterian terrace at 15-20 ft. one of aggradation from a slightly lower level than that of the present day. This aggradation led up to the flooding of the Faiyum. The latter must, however, have been excavated in part before that date, and, for such excavation, do we not also require a low

Nile? Now in both the Somme and Thames there is a great drop in sea-level after the formation of the Acheulian terraces at 100 ft. and 50 ft.¹ The terraces at this height in the Nile valley have a similar industry, and may well be followed by a similar period of low level. As yet however there is unfortunately no proof of it, but it would serve for the post-Acheulian and pre-Mousterian excavation of the Faiyum. It would presumably antedate the early Mousterian, 30-ft. terrace of the Upper Nile.

The Micoquian and Levallois III and II gravels of the 10-m. terrace in the Somme may be the equivalent of the 30 ft. Older Mousterian Gravels of the Upper Nile.

KENYA COLONY, EAST AFRICA

The succession in Kenya Colony in East Africa has been admirably investigated by L. S. B. Leakey. Here the oscillations of the lake surfaces in the Rift Valley give excellent criteria of relative age, although it is not so easy to follow the interpretation of these in terms of the Ice Ages of Europe. There are two main periods of high lake level, the Kamasian and Gamblian, which are separated by marked post-Kamasian deformation and faulting. In the disturbed Kamasian beds the Chellean is found in a highly rolled condition, accompanied by unrolled tools of Acheulian type. The Kamasian is thus entirely Older Palaeolithic.

In the lake deposits of the Gamblian epoch occur implements of both Middle and Late Palaeolithic types—Kenya Mousterian and Kenya Aurignacian, as Leakey

¹ This is the time of the solifluxion S₃ (Riss) of Levalloisian Age in the Somme Valley, where it is followed by older loess, which does not descend on to the 10-m. terrace. Its derived clays of Micoquian age do so, however. Neither Levalloisian nor Micoquian are known in the Lower Nile Valley. They are supposed by Sandford and Arkell to be beneath the alluvium.

discreetly terms them, thereby implying similarity to, but not necessarily identity with, the Mousterian and Aurignacian industries of Europe. The implements of both types, Mousterian and Aurignacian are mixed together throughout the deposits, but the finding of the Kenya Aurignacian separately, without Mousterian implements, in Gamble's Cave No. 2, indicates that they were used by different races, who occupied the countryside simultaneously but did not mix.

Gamble's Cave No. 2 at Elmenteita, just above the Enderit River, shows the following succession of strata:

- 1 and 2. Modern.
3. Barren. Nakuran Wet Phase.
4. Aeolian sand. Interpluvial. Aridity.
5. Barren
6. First occupation level, Elementeitan
7. Barren
8. Aeolian sand. Interpluvial. Aridity.
9. Barren.
10. Second occupation level. Kenya Mousterian and broken Still Bay (South African 'Solutrean' type).
11. Barren debris.
12. Third occupation level. Upper Kenya Aurignacian and burials.
13. Barren.
14. Fourth occupation level. Upper Kenya Aurignacian and fish remains.
15. Beach sand of Gamblian maximum 510 ft. above recent Lake Nakuru.

} Makalian Wet
Phase.

Leakey holds that the occurrence of fish remains in layer 14 indicates that the lake was near, so that the Gamblian maximum was not long past. There are no fish in recent Lake Nakuru. The industry of the third and fourth occupation levels yielded a variety of types including: (1) Backed blades of Chatelperron type with

a few Gravette. (2) Lunates of which the larger were really Chatelperron blades, but a few were small ($\frac{1}{2}$ in. to 1 in.). (3) Other microlithic backed blades, triangular and trapezoid. (4) Burins¹ of various types, including the Tardenoisian microburin, which Leakey thinks is due to accidental fracture. (5) Fabricators, i.e. blades triangular in section, bruised or battered on the median ridge. (6) Sinew-frayers—blades with reworked ends and secondary trimming towards the main flake surface. (7) Scrapers, cores, notches, etc. (8) An ochre-stained pestle and mortar. (9) Pottery. In the third occupation level were burials of man of Upper Palaeolithic type. It will be noted that Mousterian and Still Bay remains occur above in the second occupation level.

The essential elements in this admirably studied section are given in full because of the peculiar interest they display. The occurrence of Mousterian types above the level of the Kenya Aurignacian confirms the conclusion drawn from the lake deposits, that men with a Mousterian technique occupied the country simultaneously with the Aurignacians. This is capable of two interpretations: (1) that East Africa, as Leakey thinks, was the home of the Younger Palaeolithic, or (2) that a race using Mousterian implements persisted in East Africa into Younger Palaeolithic times. Now, in all systems of geological zoning it is a well-recognised principle that the essential point is the appearance of a new form, not the disappearance of an old. The latter is liable to linger on in unexpected places. Moreover, the Mousterian of East Africa is in part at any rate not true Mousterian, even in the broadest sense of the term. It has been given the distinctive name of Aterian, and, unlike the Mousterian (or more correctly Levalloisian) of Europe, is characterised

¹ Boring or graving tools with specially prepared points.

by Levallois flakes and a pedunculate point, the Aterian point. The pedunculate point does not appear in Europe until the end of the Younger Palaeolithic, the Font-Robert stage, just preceding the Solutrean. Now, Miss Caton Thompson (*Man*, March, 1931) has obtained *feuilles-de-laurier*¹ in the Aterian of the Kharga Oasis along with Mousterian points, discs and pedunculate points. There is, therefore, a distinct suggestion that the Aterian of Africa can be as late as the Font-Robert stage and even as late as the Solutrean. The so-called 'pseudo-Solutrean' Still Bay industry of bed 10 may well be true Solutrean.

Leakey may, therefore, be quite right in his contention that *Homo sapiens* is the contemporary of the Mousterian industry in East Africa, but in placing there the Eden of modern man he is putting the cart before the horse. The trend of the evidence at present available is to the effect that Late Palaeolithic man arrived in Africa either at the same time as he reached Europe or at a distinctly later date, for, if the Mousterian industry is a survival in that part of the world, may not the Aurignacian be the same? Indeed, this is distinctly indicated by the microlithic or Tardenoisian element described above in the Late Kenya Aurignacian, a relation which is more commonly taken as indicating the source of the Tardenoisian. The relation may, of course, be interpreted either way, but I take this opportunity of suggesting that Africa outside Egypt was, in Late Palaeolithic as in quite recent times, a cultural backwater. The presence of malaria, sleeping sickness, yellow fever and other deadly diseases may well be the explanation of this peculiarity.

The Elmenteitan of the first culture layer is true Mesolithic. It has a cruder lithic culture than the

¹ Or laurel-leaf points, see p. 14.

Aurignacian, but developed pottery. The inventory includes large blades, *lames ecaillées*, scrapers, notches and microliths—triangles and lunates. It belongs to the Makalian Wet Phase, and is separated from the late Aurignacian by a big hiatus during which the climate was too dry for man. There are two later phases in Kenya: the Wilton, belonging to the decline of the Makalian, is a microlithic industry with trapezes, and the Gumban of the Nakuru Wet Phase, with tools as in the Elmenteitan and in addition stone bowls and hammers, may well be Proto-Neolithic.

The pluvial and interpluvial periods in Africa, which appear to control the human occupations of the country, are exceedingly interesting, and tempt a correlation with Europe, but on what climatic assumption is such a correlation to be made? Nillson has shown that on two occasions in the past the glaciers of Kenya and Kilimanjaro had a greater extension than at present. This presumably happened in the wet phases, but even regarding this there is room for doubt, and there are no grounds at all for placing these glacier extensions in any of the European Glaciations.

CAPSIAN, SEBILIAN AND TARDENOISIAN

The Capsian is the dominant Younger Palaeolithic industry of North Africa. Its type locality is Gafsa in Tunis, where it occurs in the younger horizontal beds, which are unaffected by the Quaternary folding of that area. The older folded alluvial strata are Chellean, Acheulian and 'Levalloisian.' The 'Levalloisian' flakes have unprepared striking platforms and may therefore be Clactonian. The unconformity which separates these beds from the later horizontal ones prevents the origin

of the Capsian industry being traced in the type locality.

The Early Capsian corresponds to the Aurignacian of Europe and consists of an admixture of Early and Late Aurignacian industries, containing both Chatelperron and Gravette blades, and a fair quantity of geometric microliths of Tardenoisian type (Fig. 68). It evolves into the Late Capsian with geometric implements and large bone needles. The industry apparently passed from Africa into Southern and Central Spain as far as the Cantabrian

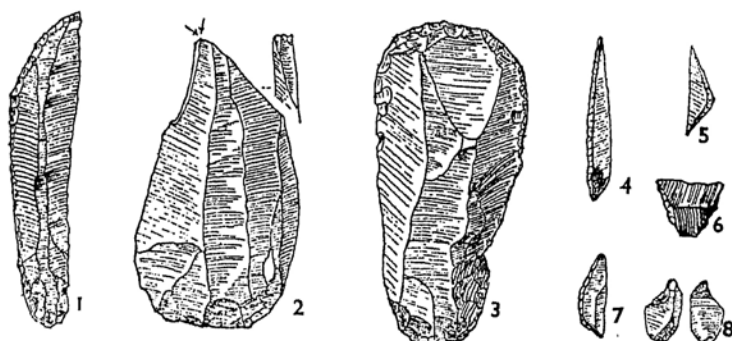


Fig. 68. Capsian Implements from the Type Locality, D'El Mekta, Gafsa, Tunis. (After Vaufray). 1, Chatelperron point and blade. 2, Bevim. 3, Serapu (*grattoir*). 4-8, Microlitho. 4, Point. 5, Triangle. 6, Trapeze or *petit tranchet*. 7, Lunate. 8, Micro-burin.

Scale, $\frac{2}{3}$

Mountains, whence it spread later in Mesolithic times over the greater part of western Europe to form what is called the Tardenoisian.

The Solutrean and Magdalenian appear to be excluded by the Capsian over the greater part of its area of distribution, being restricted in western Europe to France and the Cantabrian region with perhaps some penetration down the Mediterranean coast of Spain (Obermaier), and with these cultures go their distinctive types of art (see Chap. XVII).

The Younger Palaeolithic industries of Europe are always associated with a modern type of man (*Homo sapiens*) and the same is true of the Capsian industries of Africa. On the other hand the men of the Mousterian were Neanderthaloid (*Homo neanderthalensis*). The last thing that one would expect, therefore, is a passage from the Mousterian to the Capsian types of implement. This, however, is what Vignard has proved in the Sebilian industry of Kom Ombo on the Nile.

Kom Ombo is a low-lying plain, 840 km. to the south of Cairo, which was a marsh in Mousterian times. Vignard pictures it as a lake in process of being drained by lowering of the outlet: Sandford as somewhat equivalent to the present Sudd. With the desiccation of the climate the higher parts of the plain emerged and became dry land. On these areas Mousterian man established himself. His tools are made of diorite and other igneous rocks, grit and quartz. There is very little flint. The abundant local outcrops of this best of all materials were at that time submerged. There are discoid nuclei with one side only partly decorticated. These have a carefully prepared striking platform with several facets. There are flakes of Levallois type and also small Mousterian points, showing previously prepared striking platforms with several facets. The bulb of percussion is frequently removed by secondary working. The Mousterian flake-points sometimes show secondary retouch. The surface sites on which these implements occur mostly prove to be contaminated with later types, but at least one area was subsequently unoccupied, and so gives the industry in its pure state. This is Sebilian I.

At lower levels, apparently occupied as the land emerged, and also on little bands of earth then for the first time laid bare, occurs a later industry, Sebilian II.

The nuclei are much more varied. Ordinary semi-decorticated Mousterian nuclei, as in level I, occur, but are rare. More common are nuclei with both faces decorticated. Great numbers show, however, a character which occurs only rarely in level I—namely, the occurrence of two carefully prepared striking platforms. These double-ended cores (cf. Fig. 67) are an outstanding character of Sebilian II. The flakes removed from opposite faces are generally in opposite directions, but occasionally perpendicular to one another. Flint is now a commonly used material having become exposed on the plain to the east. The Levallois flake proper disappears.

The most interesting of all the features of this industry

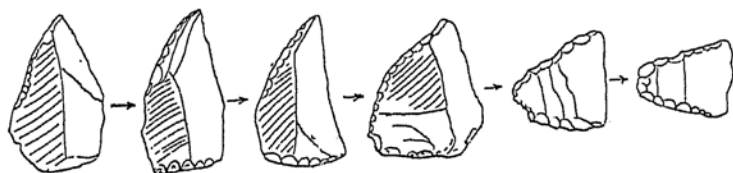


Fig. 69. Evolution of the Sebilian Trapeze. Level II, Kom Ombo.
(After Vignard)

Scale, $\frac{1}{2}$

is the character of the secondary working by which the Mousterian flakes are reduced to the form apparently desired. This is at first a removal or blunting of one cutting edge by a nibbling retouch, possibly to strengthen the point. The flake then becomes asymmetric. The retouch is in many cases extended to the base, and there results a form almost indistinguishable from the trapeze or *petit tranchet* of the Capsian (Fig. 69). In the flakes collected by Vignard there is perfect transition from the Mousterian point to the trapeze, triangle and semi-lunate of the later microlithic industry. The birth of a new type of implement is demonstrated step by step and with perfect continuity.

The third level is concentrated in the hollows around what were once the dwindling streams and springs. The industry is frankly Tardenoisian, but relics of level II persist in the small double-ended cores of Mousterian type, simple flakes with or without retouched bases, and points with one side and base retouched. The great bulk of the industry, however, consists of triangles and trapezes, semi-lunates and blunt-backed blades. Notched points, saws, pedunculated points and unilateral arrow-heads also occur, but the most characteristic tool of all is the Tardenoisian burin, which is completely absent from higher levels. This is Sebilian III and after it came complete desiccation and the dispersal of the race.

Thus, locally at any rate, we see one of the origins of the Tardenoisian microlithic culture, which bases itself in Egypt on unadulterated Mousterian. Elsewhere in North Africa it appears to spring from the Older Capsian, which is undoubtedly Younger Palaeolithic in aspect with its blunt-back blades of Chatelperron and Gravette types. We know that men with Mousterian and Aurignacian industries existed together in Africa. It is simplest to imagine that they both learned the microlithic technique at the same time, possibly under the pressure of some change of conditions which affected them both. This may well have been a scarcity of game caused by progressive desiccation. There is no necessity for conceiving of independent evolution in the two cases, for the route from Little Africa into Egypt was at that time probably much more easily traversed than at the present day.

CHAPTER XIV

PALESTINE

To the archaeologist in search of origins, Palestine has always seemed a key position, situated at the forking of the ways into the two great western continents. The land has therefore for a long time past been the Mecca of workers from the British, French and American Schools. To these, to Miss Dorothy Garrod, F. Turville Petre, R. Neuville and T. D. McCown, we now owe a very considerable knowledge of the sequence in Palaeolithic and Mesolithic times. The work has been carried out with the most scrupulous care and accuracy, and the results are of unusual interest, but the solution of European and African origins must be sought further east.

For all experience is an arch wherethrough
Gleams that untravelled world whose margin fades
For ever and for ever as we roam.

According to Miss Garrod, Palestine was throughout Palaeolithic times an outpost of Europe, which shows only slight signs of African influence. It displays, however, distinct local peculiarities in the later stages, the Younger Palaeolithic and the Mesolithic. The stratigraphy, complete as it is, is dependent entirely on caves, and is not yet correlated with any Pleistocene geological succession. The climatic sequence elaborated by Miss D. M. A. Bate from a study of the mammals on the archaeological levels is therefore of especial importance. It is beautifully brought out by her *Dama-Gazella* curve (Fig. 70)

which gives simply the balance between two abundant species, the deer and the gazelle, one an inhabitant of moist woodlands, the other a desert dweller. In the first column are given the archaeological horizons, and in

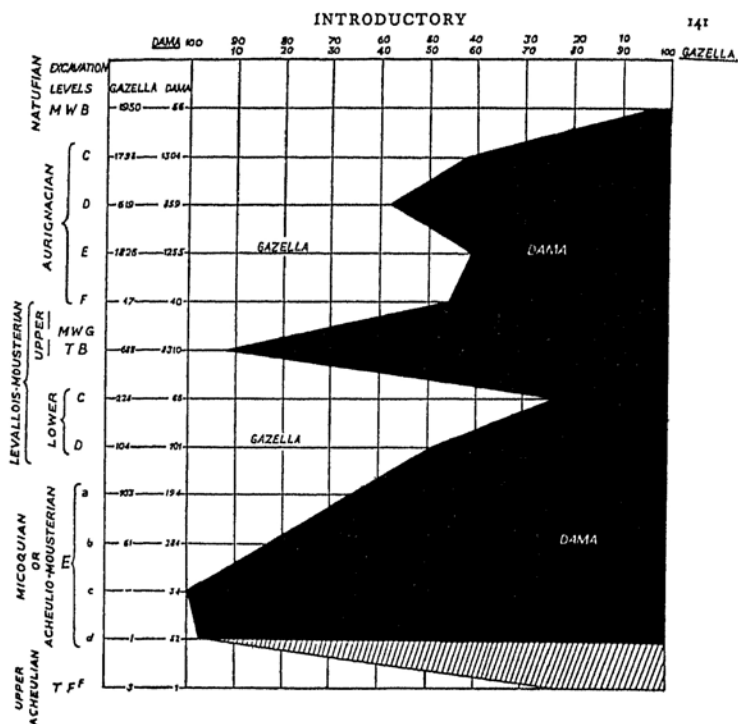


Fig. 70. Graph showing the Comparative Frequency of *Dama* and *Gazella* during the period of Human Occupation of Tabun and Mughareh-el-Wad. This is suggested as an indication of varying moist (*Dama*) and dry (*Gazella*) climatic conditions. The actual numbers of specimens are given in the left-hand column. The earliest part of the deposit is shown shaded owing to the very small number of specimens obtained. (From *The Stone Age of Mount Carmel*, I, by D.A.E. Garrod and D.M.A. Bate: Clarendon Press)

the second and third the numbers of each species, while the curve shows the percentage variation of both. It will be noted that there are maxima of humidity in the Micoquian, the Upper Levallois-Mousterian and the

Aurignacian. There is nothing indicative of change of temperature, and it would be rash to attempt a correlation on climatological grounds with the ice ages of Northern Europe. It is interesting to make the attempt, however, remembering that there is as much reason to imagine Palestine to have been dry during the ice ages as during the Interglacial periods, on account of the presumed lower sea-level (*see* Chap. XVIII). I thus see two Ice Ages in the two dry periods, and interpret the present drought as the culmination of the progressive desiccation of the Eastern Mediterranean, since Mousterian times (Sandford), which I conceive to be superimposed on the glacially controlled oscillation, and due to quite different and unknown causes. This interpretation seems to be less in conflict with the typology than any other.

The succession given by Miss Garrod is composite of several caves in the Wady el-Mughara at the western foot of Mount Carmel. These are Mugharet-el-Wad, Et-Tabun and Mugharet-es-Skhul, the latter excavated by T. D. McCown. The succession ranges from Tayacian and Upper Acheulian to Bronze Age. The surface finds in Palestine have yielded nothing older than Upper Acheulian, so that the caves evidently give the whole Palaeolithic sequence.

I and II. Under the Recent and Bronze Age deposits occurs the Natufian or local Mesolithic industry, with abundant microliths including lunates, micro-burins, sickle blades and occasional notched arrow-heads, also bone pins, pendants and harpoons. The presence of the micro-burin distinguishes the Upper Natufian from the Lower. There are bone sickle-hafts with grooves for the reception of microliths, and one of these has two blades in place. It will be noted that this industry immediately precedes the Bronze Age. There is, as a matter of fact,

no Neolithic anywhere in Palestine, nor does the Natufian owe anything to the well-known Neolithic of Egypt.

III. Beneath the Natufian but separated from it by a distinct break come the very interesting Upper Palaeolithic deposits. The Atlitian is probably contemporaneous with the Magdalenian of France. It has affinities

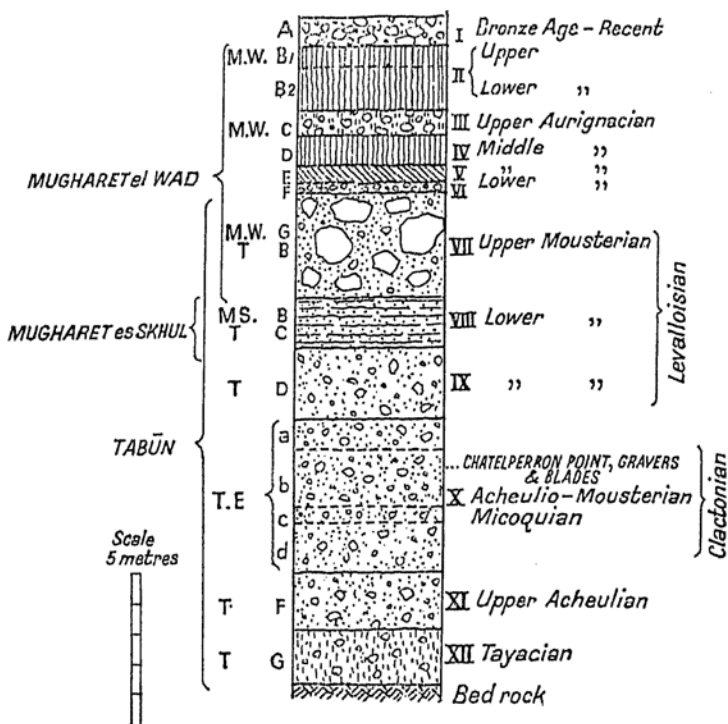


Fig. 71. Composite Section of the Caves of Mount Carmel.
(After D. A. E. Garrod)

with the Middle Aurignacian below, but does not exactly correspond to any recognised stage either of that culture or the Upper Aurignacian. It has polyhedric burins, steep scrapers, and, in smaller numbers, Chatelperron points (Fig. 72, 3). The latter, it will be remembered, is a characteristic form of the Lower Aurignacian of France.

Here, however, it recurs at the top and this feature suggests affinities with the Capsian of North Africa, but it is the only tool which it has in common with this latter industry.

IV. The Late Middle Aurignacian is very like that of Europe with rostrate, carinate and end-scrapers and blades worked all round with the characteristic broad flat retouch. There were, however, no bone implements, although this is the level of the split base point or *pointe*

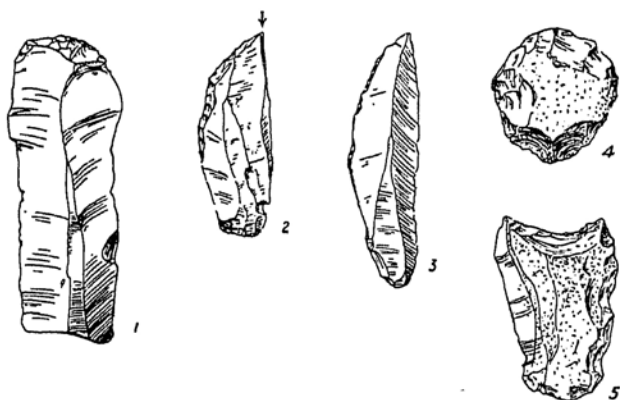


Fig. 72. Mughareh-el-Wad: Upper Aurignacian, C. 1, End-scraper. 2, Angle burin. 3, Chatelperron point. 4, Round-scraper. 5, Angle burin. (After D. A. E. Garrod)

Scale a little less than $\frac{1}{2}$

d'Aurignac. Miss Garrod suggests the use of wood instead of bone, as there was much charcoal in the layer. She thinks the *pointe d'Aurignac*, with its technique of splitting the bone instead of cutting it into a fork, may have had a wooden prototype.

V. The Early Middle Aurignacian was of the same general character, but the rostrate type of scraper was rare. There were small, finely retouched flint points of Font-Yves type (Fig. 74) and a few bone points.

VI. The Lower Aurignacian was much disturbed by

water action and there had been considerable admixture with the underlying Mousterian. Among the tools were

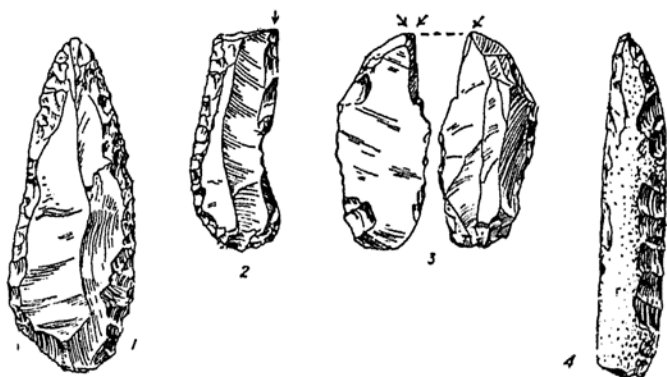


Fig. 73. Mugharet-el-Wad: Middle Aurignacian, D and E.
1, Point. 2, Angle burin. 3, *Bec-de-flûte* burin. 4, Point.
(After D. A. E. Garrod)

Scale a little less than $\frac{1}{2}$

blunt-backed blades, more or less of Chatelperron type, and also a few leaf-shaped points of what is known as the 'Emireh' or 'Tabelbalat' (Sahara) type with careful

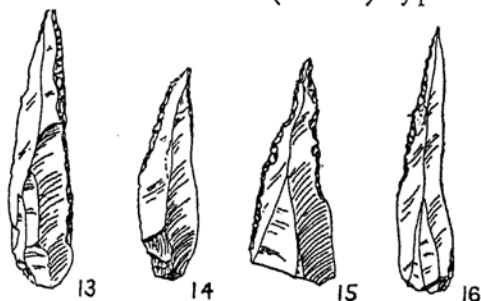


Fig. 74. Font-Yves Points. Implements from the Mugharet-el-Wad. Layer E, Middle Aurignacian. (From *The Stone Age of Mount Carmel*, I, by D. A. E. Garrod and D. M. A. Bate: Clarendon Press)

Scale, $\frac{2}{3}$

retouch at the base of the bulbar face (Fig. 75). These points are unknown in Europe, but they occur in the Aterian of North Africa. The typical tanged point of

the Aterian was, however, not present, so that any African connection is extremely doubtful.

VII. The Upper Levallois-Mousterian, of which a complete succession was found in Tabun, differed considerably from that of Europe. It had small triangular and oval Levallois flakes. The points and scrapers had a beautiful flat retouch. The majority of the points had faceted striking platforms.

VIII and IX. The Lower Levallois-Mousterian had Levallois flakes, often of large size, but some were still triangular, especially in the lower levels (IX). The



Fig. 75. Implements from the Mughareh-el-Wad. Layer FI, Lower Aurignacian. Emireh Points: Tabel Bala type. (From *The Stone Age of Mount Carmel*, I, by D. A. E. Garrod and D. M. A. Bate: Clarendon Press)

Scale, $\frac{1}{2}$

majority had faceted striking platforms. A fair number of points had retouch on the bulbar face, some approaching the Bambata or Still Bay types (*see* Chap. XV). There was a certain admixture of Upper Palaeolithic implements, such as Chatelperron and Audi points.

X. The Micoquian showed a mixture of Acheulian and Clactonian types. There were a large number of thick scrapers made on flakes with unfaceted striking platforms and hand-axes of which the majority were pear-shaped and often rather rough. Below the middle was a layer with hand-axes of true Micoquian type, broad

at the base, with fine, sharp tapering points. Here as in the layer above, and undoubtedly in place, were implements of Upper Palaeolithic type including Chatelperron points, end-scrapers, graters and narrow blades with nibbling retouch. This according to Miss Garrod is

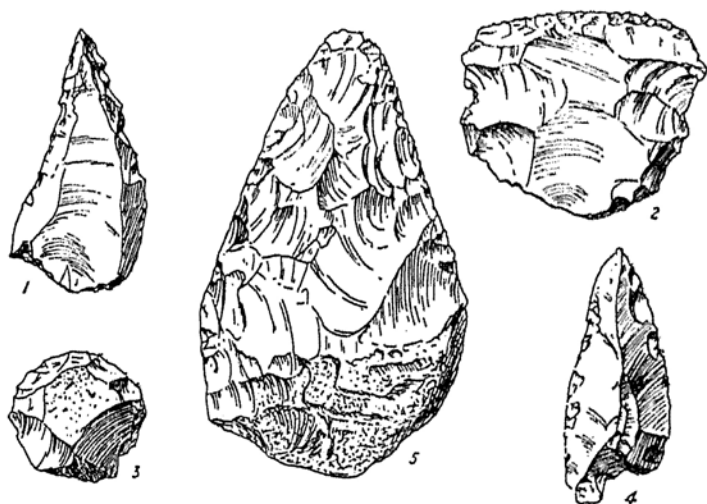


Fig. 76. Lower Mousterian Implements from Mugharet-es-Skhul. 1, 4, Points. 2, Side-scraper. 3, Disc or core-scraper. 5, *Coup-de-poing*.

Scale a little less than $\frac{1}{2}$

probably due to contact with very early Aurignacian rather than to development *in situ*.

XI. In the Upper Acheulian the hand-axe predominates all through and towards the bottom-scrapers and points become more and more uncommon. The hand-axes are mostly pear-shaped, but there are one or two ovates. The true Micoquian type is very rare.

XII. The basal industry, which Miss Garrod identifies as Tayacian (*see* p. 45) consists almost entirely of small flakes with a plain striking platform and little secondary working. There are no hand-axes.

There is thus no proof here, nor anywhere in Palestine,

of any industry older than the Tayacian and Upper Acheulian. These industries also form the base in the cave of Oumm Qatafa, about 15 km. west of the Dead Sea, excavated by René Neuville. At the bottom are strata, which Neuville reports in his paper as barren, but in which Tayacian implements were apparently subsequently found. In the beds above these, great *coups-de-poing* of classic Acheulian cordiform type are dominant, and the rough flakes have Clactonian unfacetted platforms. In still higher strata the *coups-de-poing* are smaller and their number diminishes progressively upwards, as if man were gradually abandoning the biface for the uniface implement. There is a perfect passage from the typical small *coup-de-poing* through that made from a flake flatter on one side than the other, to the simple one-sided flake. The flake tools also become more perfect in the upper part of the succession, and the facetted striking platform appears, although with only a few facets. There is thus an approach in the upper layers to the Micoquian. The fauna is moist and temperate.

At any rate, we have in Palestine a practically continuous succession from the Tayacian to the Early Bronze Age. The nearest approach to anything in the nature of a break is between the Upper Palaeolithic and the Mesolithic. Taken as a whole, there is very little affinity with either Egypt or North Africa. The Upper Acheulian pyriform axes, often with unworked butt, resemble those of the Kharga Oasis, but after this the industries part company, for the final Acheulio-Levalloisian of Kharga contains abundant Levallois flakes, whereas the flake industry accompanying the Micoquian of Palestine is Clactonian.

The succeeding long period of Levalloiso-Mousterian,

to the exclusion of classic Mousterian, Miss Garrod seems to think shows a correspondence with the African rather than with the European succession, but from the end of the Mousterian to the beginning of the Bronze Age there is no contact with the south, the Aterian, Sebilian and Capsian never having reached Palestine. The presence of the Emireh point, however, gives the Lower Aurignacian a distinctive character.

The Middle Aurignacian closely resembles that of western Europe. A distribution map of this industry shows it extending as a broad belt across central Europe, and the presence in the Near East of an unmixed industry of this type, covering the Middle and Upper Aurignacian and the Solutrean of the west, seems to indicate that its origin is here.

The unique Atlitian apparently takes the place of the Magdalenian in western Europe, and the Mesolithic, apart from the presence of some ubiquitous types of microlith, is definitely original, as might be expected, since by this time local differentiation all over the world is much more marked than in former periods.

According to Miss Garrod's earlier papers, the whole Lower Palaeolithic of Palestine is Riss-Würm, but she adopts a more cautious attitude in her monograph and refuses to attempt a correlation. I see no reason for such lack of confidence in the zonal significance of the industries. The succession is admitted to be that of Europe, and in Europe the Micoquian is Riss-Würm. The two dry periods following the Micoquian in Palestine are presumably the first and second maxima of the Würm.

PLATE VI



Portion of the Frieze in the Bambata Cave, Southern Rhodesia (R.A.I.)

CHAPTER XV

SOUTH AFRICA

As the Palaeolithic industries of Africa were studied one by one during the first quarter of the present century it became apparent that they were in a broad way very similar to those of Europe. In the gravel of the plateaus there was a pebble industry obviously very much older than anything else, just as our Kentian or Harrisonian coliths are older. Next come the Stellenbosch industries with their *coups-de-poing* of Chellean and Acheulian types. We should probably nowadays call all but a few Acheulian. In other localities were the Fauersmith industries of Levalloisian type, the middle stage of which has Acheulian implements associated, and is a sort of Acheulio-Mousterian in the older sense of the terms—one hesitates to suggest Micoquian, as that term is now so well defined, but something evidently parallel. There followed the Upper Palaeolithic industries—broadly similar to those of Europe, but with curious differences—Still Bay, Cape Flats and Fishhoek, showing a strange merging of Mousterian (*s.l.*) and Aurignacian features, and ending up in bifaces with what has been called a 'Pseudo-Solutrean' appearance. But why the *pseudo*? It is all so parallel, with just that amount of difference which one would expect distance to give. There is, of course, no Magdalenian. That is an Arctic industry, but there is the Wilton, the obvious equivalent of our Tardenoisian with its microliths and characteristic burins.

The Bambata Cave. It remained, however, for Mr.

A. Leslie Armstrong to weave these more or less disconnected industries into a sequence by his admirable excavations in the Bambata Cave in Southern Rhodesia. Here he proved the section shown in Fig. 78.

In the lower level were bifaced hand-axes of obviously Older Palaeolithic type, together with cleavers, a rather distinctive type of tool which Mr. L. S. B. Leakey had hitherto shown to be characteristic of the Older Palaeolithic of Kenya Colony. Over these came the layers with

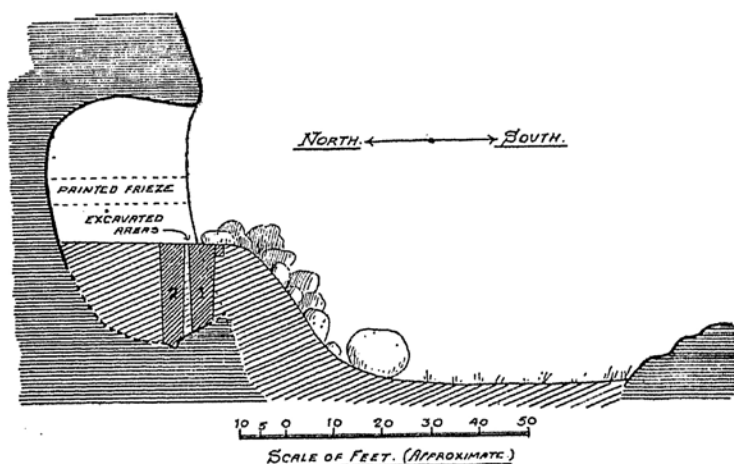


Fig. 77. Section of Bambata Cave (Approximate).
(*Royal Anthropological Institute*)

Mousterian implements (Fig. 79). Occasional Mousterian points show a rude pedunculate base, like those of the Aterian (=Late Mousterian) of North Africa. In the upper portion of this stratum were two intrusive layers of the overlying Bambata or Younger Palaeolithic culture with burins, showing that Neanthropic man was somewhere in the district, while the Mousterians still occupied the cave. There is, however, no blending of industries. Mousterian man was clearly temporarily driven out while Younger Palaeolithic man occupied the cave. Higher

up, where the Mousterian implements give place to Bambata types, there is a certain amount of assimilation,

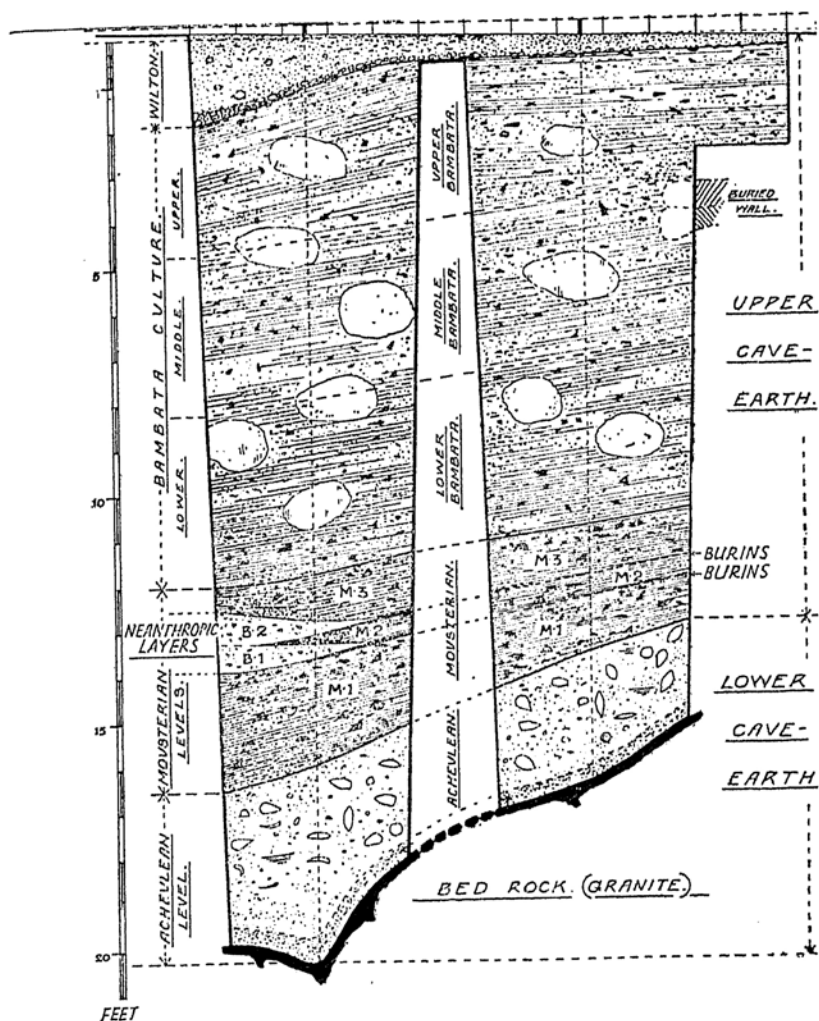


Fig. 78. Stratigraphy of Bambata Cave. (*Royal Anthropological Institute*)

for the Bambata people continued to make Mousterian points of a highly improved form, and they subsequently developed these, first by chipping all over the convex

side, then by additional chipping round the edges of the flat side, and finally by flaking all over both sides, so as to form beautifully shaped bifaced lance-points of Solutrean type. Mr. Armstrong does not call these Pseudo-Solutrean, but rather suggests that here we may have the origin of the *feuille-de-laurier*, which made such a sudden appearance in Europe towards the close of Younger Palaeolithic times. The development of this laurel-leaf point in the Upper Palaeolithic of Bambata Cave had been foreshadowed by Burkitt and Harding from the study of surface finds, but had never before been demonstrated stratigraphically.

In addition, the Bambata culture shows, even in the unsuitable materials of quartz and chalcedony, many of the typical implements of the Younger Palaeolithic, including burins and backed blades, and also awls and scrapers, but the really interesting point is its continuity with the Mousterian industry below and the ultimate development therefrom, in the uppermost layers, of the laurel-leaf point of the Solutrean and the pedunculated point of the Aterian.

At the top of all comes the Wilton industry, which, with its microliths of lunate, triangular and trapezoid forms, micro-burins, thumbnail scrapers and beads of ostrich egg-shell is clearly late Capsian or Tardenoisian. Throughout the Bambata and Wiltonian strata fragments of ochre have been found, and on the walls of the cave are drawings and paintings in this same ochre. These depict both animals and men (Pls. VI and VII), the former with a realism which rivals that of the famous artist-hunters of France and Cantabrian Spain. The figures of men are rather stylised, like those of eastern Spain, but like these occasionally display considerable vigour of motion.

The paintings show a fair amount of overlapping or

PLATE VII



Figures of Men and Animals from the Bambata Cave,
Southern Rhodesia (R.A.I.)

superposition. The oldest, now almost completely faded, are in yellow ochre. Over these are red drawings, and on these again brown and red. The various ochres used make their appearance in the same order in the strata from Middle Bambata upwards. There is, therefore,

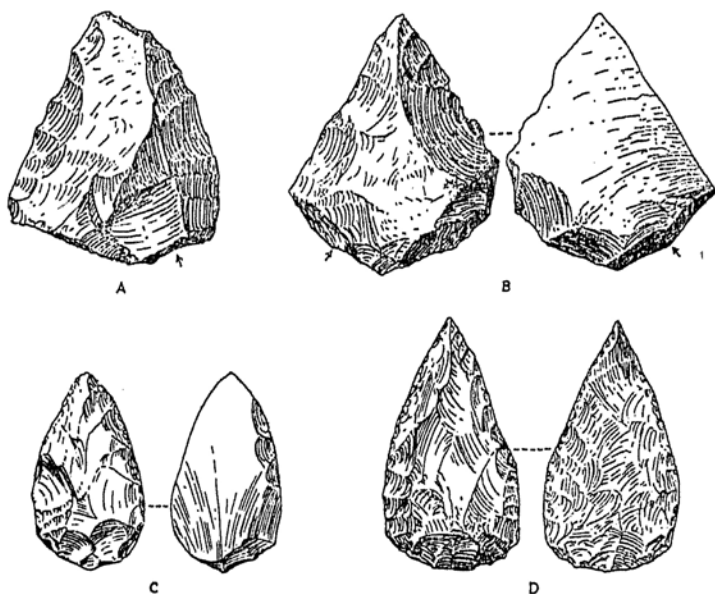


Fig. 79. Flake Implements from the Bambata Cave, Southern Rhodesia. A, Mousterian. B, Lower Bambata. C, Middle Bambata. D, Upper Bambata. A, B, D in quartz. C in indurated shale. (After Leslie Armstrong)

Scale, $\frac{1}{16}$

no doubt whatsoever that the drawings are of Younger Palaeolithic age.

Palaeolithic Chronology of the Zambezi Falls. The River Zambezi approaches the famous falls as a shallow, island-studded stream over a mile wide. It plunges over the fall into a narrow gorge less than one-twentieth of the original width of the river, and leaves this gorge by an equally narrow outlet, to enter a second gorge almost equally narrow, and so on in a series of zigzags, for a

distance of forty miles. The first gorge into which the river falls is along a shatter belt or line of weakness in the rocks, the gap by which it emerges is cut through the solid rock. The second, third and further gorges are also along lines of weakness, and it is clear that the river once

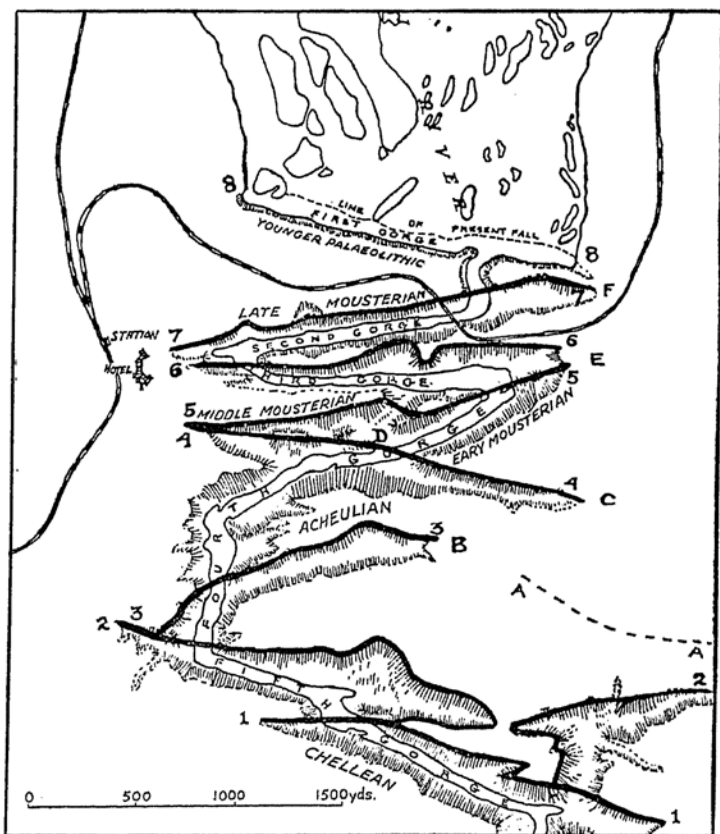


Fig. 80. Map of Victoria Falls. (*Royal Anthropological Institute*)

fell into them over their northern edges, as it does at the present day into the first gorge. Indeed, the edges of the more recently formed gorges can be seen to be distinctly waterworn. The areas between the successive gorges are covered with the gravels of the ancient river, which thus

once pursued a peaceful course across the plateau some 400 ft. above the present turbulent stream.

In these gravels of the plateaus, as first noted by Colonel Fielden in 1905, and confirmed by Lamplugh in 1906, are Palaeolithic implements, some quite fresh but many rolled and waterworn. The discrimination of types, and of the degrees of abrasion as well as the correlation with the various positions of the Falls, was first made by A. Leslie Armstrong and published in 1936. Pre-Chellean, Chellean, Acheulian, Clactonian, Levalloisian, Mousterian (*s.l.*) and Bambata cultures are all represented. Even Reid Moir's rostro-carinate implements of sub-crag date are present.

All cases of possible abrasion by lateral torrents or inclusion in their gravels having been carefully excluded from consideration, it is clear that implements found in the gravels of the plateau between the gorges must, especially if waterworn, have been made and incorporated while the Falls still lay to the south of where they are found. Moreover, since abrasion only ceased when the Falls passed north of them, the degree of abrasion of implements of any one age should increase as the recent Falls are approached. Thus the Pre-Chellean implements are found throughout the whole area investigated (*see* map, Fig. 80). In the vicinity of gorge 5 they are predominant, and south of this, at the furthest point reached, are the only implements. The falls of Pre-Chellean times must have lain somewhere to the south. The implements of this date are progressively more rolled going north, and between the Late Acheulian Falls (4-4) and the present Falls are frequently almost reduced to pebbles.

As far south as was investigated the distribution of Chellean implements was very similar. Like the

Pre-Chellean, they antedate the cutting of gorge 5, rolled specimens having been collected in close proximity to it.

The Acheulian is the most abundant of all the cultures and the best represented, both Lower (1), Middle (2) and Upper (3) Acheulian being present. All the *coups-de-poing* exhibit the advanced or so-called 'wood' technique. Scrapers and burins occur, but the cleaver is rare. South of the line A-A the implements of Acheulian (1) are unrolled but from A-A to C they are slightly rolled.

Implements of Acheulian (2) and (3) are unrolled south of C while from C to E all Acheulian implements are rolled, Acheulian (1) considerably and (2) and (3) moderately. North of E all implements of this culture are well rolled and progressively more so as the present Falls are approached.

In physical condition, the Clactonian implements are counterparts of the Acheulian. Clactonian II is comparable in location and degree of rolling with Acheulian (1) and Clactonian III with Acheulian (2 and 3). The Clactonian and Acheulian implements in the Zambezi Valley were contemporaneous—that is to say, produced by one race of man or by two living side by side.

The Levalloisian technique began early in the Zambezi Valley and persisted a long time, from at least Acheulian I down into Bambata times, showing a progressive diminution in size. Like the Acheulian, they are only unrolled south of the line A-A. North of that their degree of rolling agrees with that of the Acheulian implements with which they are associated.

The Rhodesian Mousterian industry represented at the Falls is closely comparable to that found in the Bambata Cave in stratigraphical succession to the late Acheulian. The point in various forms is the typical implement, and

a conspicuous feature is the location of the bulb and striking platform on the side of the instrument. As in the Bambata Mousterian small instruments resembling in form 'unstruck tortoise-cores' and about the size of a walnut are common.

North of point E the implements of Bambata Mousterian type, except the very latest, are entirely rolled and become increasingly so north of point F. Between E and C the earliest implements display slight evidence of river action, but those of the middle phase are unrolled. South of C the whole series are unrolled.

All implements of the Bambata culture proper are unrolled, except where involved in recent torrents. One or two crescents represent the final expression of the culture. The Wilton industry is absent.

The Pre-Chellean implements antedate the fifth gorge, being the only implements in the gravels to the south of that gorge. Before the end of Chellean times the southern half of the fifth gorge had been eroded. The fourth gorge (*see* map) was in the main eroded during Acheulian times, and completed (D-E) in the Early Mousterian. The fall was functioning along the level 5-5 in the Middle Mousterian. The third and second gorges were Late Mousterian, and the first is the product of erosion during the Late Palaeolithic.

We thus have in terms of recession of the Falls—

Since the Chellean	5 miles.
„ Acheulian	3 miles.
„ Middle Mousterian . .	2½ miles.
„ Late Mousterian . . .	1 mile.

But, of course, we cannot translate these into time ratios, since the motion is absolutely saltatory, and the amount of cross cutting between the gorges is hardly comparable.

The figures do, however, give us some conception of relative ages.

The subtlety of this lovely piece of work lies in the use of the abrasion factor. There is no stratigraphy whatever. Since there is only 9 in. of gravel in all, the principle of superposition is inoperative. That so much can come of a combination of typology with the degree of rolling gives one wonderful confidence in the latter as an indication of age.

CHAPTER XVI

MODE OF LIFE

OBERMAIER draws an instructive picture of the hunting of Early Palaeolithic man. His crude weapons of wood and stone would have been powerless against the great pachyderms which formed his principal prey. He is unlikely to have attacked them in the open. Even the finer weapons of the Late Palaeolithic were not extraordinarily effective against such animals as the elephant and rhinoceros, as is illustrated by the fact that these possessors of superior arms preferred smaller and less thick-skinned game, such as the bison, the horse and the deer. Early Palaeolithic man was, however, in the main a big-game hunter, a fact which would seem to indicate that the trap was more useful to him than his weapons. A steep-sided pit, dug along some forest path or on the beaten track to the watering-place, would be covered with branches and leaves, and into this would crash the heavy animals, to be impaled on some fire-sharpened stake in the bottom or beaten to death from above when exhausted. It must have been a brutal and dangerous game. That it was the one that was practised there can be little doubt, as is indicated by the fact that the kill of these hunters included a preponderance of young animals, which, as Obermaier points out, precede their mothers on the march, and so would fall first into the trap. Obermaier also thinks that, like the Bushmen, the Palaeolithic hunters were skilled in selecting sickly or gravid animals and tracking them down.

Still, Older Palaeolithic man by no means despised the smaller animals. Cattle, horses and deer were all hunted, and so was the bear, the latter probably by closing the entrance to his den and suffocating him with smoke. The carnivores would only be killed in self-defence.

There is no reason to suppose that the hunters of the south, those whom Breuil imagines as using the biface or *coup-de-poing* as their main weapon, were clothed. They may, however, have used skins for other purposes, such as shelter or covering by night. Scrapers such as were used for the dressing of skins are found among their tools. It is much more likely that the men of the north and east, the flake-tool makers, clothed themselves partially with skins, and it is significant that the side-scraper is among the most prominent and characteristic implements of the Clactonians, Levalloisians and Mousterians.

All archaeologists seem to be agreed that the main implements of Older Palaeolithic man must have been of wood. Obermaier seems to think that some of the stone implements may have been hafted, but does not say how he conceives this was done. The shape of the great majority is certainly very badly adapted for any such use, although the Levallois point might possibly be set in a wooden socket.

Of the life of the Late Palaeolithic hunters we know a great deal more. Their abundant repertory of weapons and implements and, above all, their highly naturalistic art gives us some insight into their habits. At the same time the conclusions to be drawn from the latter are limited by the apparently studious care with which the artists avoided depicting the human figure. I am now referring to the wall engravings in the caves north of the Pyrenees and Cantabrian Mountains. In these the only representations of man are of apparently masked individuals

dressed up in animal skins or otherwise disguised. There are a few exceptions, such as, for instance, the Aurignacian 'archer' of Laussel and the anthropomorphic figures of Mas d'Azil and Combarelles, etc., but these latter do not show the skill displayed by the animal drawings.

The favourite game of the Late Palaeolithic hunters was the reindeer, of which there must have been great herds, though there is nothing to suggest that they were even semi-domesticated. Obermaier says the domestication of the horse or reindeer would be possible only with the help of the domesticated dog, and of this there is no trace in any Palaeolithic deposits. Although the old methods of hunting by traps and pitfalls were probably by no means abandoned, and were still used in dealing with the mammoth and rhinoceros, there was, nevertheless, a preference for smaller game and for the manufacture of weapons effective at a distance, such as lances pointed with bone, horn and ivory. The people of south-east Spain had the bow and arrow, as shown by their drawings, but the use of this in France and the Cantabrian region in the Late Palaeolithic can only be inferred rather doubtfully from the pose of the 'archer' of Laussel, in which the bow is not actually preserved, and may never have been depicted, owing to the difficulty of the medium.

PHYSICAL TYPE

In how far can we picture the appearance of these prehistoric hunters whose remains we have passed in brief review? Of the races which used the Chellean, Acheulian and Clactonian type of implement, we know absolutely nothing, though news of the discovery of some bones of Acheulian man in the 100-ft. terrace of the Thames has just come to hand. We may suppose,

following Breuil, that the Clactonian and Acheulian men were of different races, the former having their distribution to the north and east and the latter to the south and west of northern France. How otherwise can we explain the undoubted fact that Acheulian man rarely crossed the Rhine into Germany, and that Clactonian man only made periodic appearances in France and England, and did not mix at all freely with Acheulian man. The latter we may picture as a naked savage, but the Clactonians, on account of their colder climate, possibly used furs for clothing. Their industry shows many scrapers and boring tools, the use of which was most probably for the preparation of animal skins. They were, however, hardly a superior race, for in Interglacial times they appear to have been driven north by the Acheulians out of what must have been the superior hunting grounds. They did not follow the cold animals north, but stayed as long as they were permitted. On the other hand, Acheulian man but rarely pursued them into the wilds of Germany, otherwise more than some half-dozen hand-axes would have been found in that country. The turbulent summer flood of the Rhine would have been no mean barrier to men almost certainly without boats, and what men would start on a voluntary adventure during the winter.

Both races probably knew the use of fire both as a source of heat and for other purposes, such as protection from wild animals, and the sharpening and hardening of weapons of wood, but of this there is no direct evidence. Our ignorance is abyssal.

The Levalloisians appear at the end of the great Acheulian Interglacial, the Mindel-Riss. The change of industry from Clactonian to Levalloisian is not so great or so rapid as to imply a change of race. It is more likely a matter of evolution. The Levalloisian was, however,

a long period covering the Riss Ice Age and all the Riss-Würm Interglacial. We do not know exactly to what period to ascribe the first specimens of the Neanderthal type of skeleton. A very considerable number of these are now known, and they are invariably associated with Levalloisian or Mousterian implements. Neanderthal man or *Homo neanderthalensis* was quite a distinct race from modern man, although atavistic types with similar characters appearing among modern races seem to show that the strain has not been entirely lost, but forms a real, though

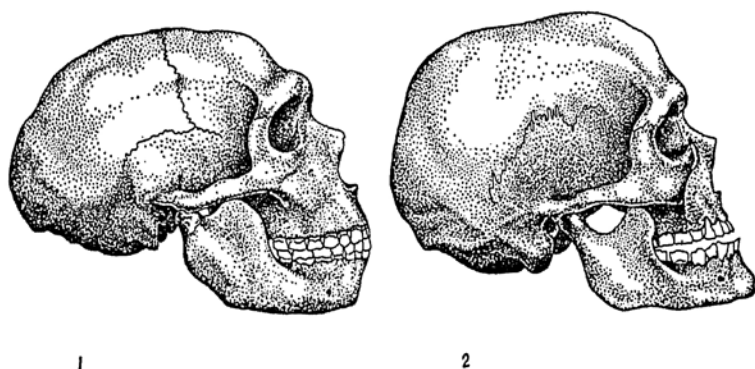


Fig. 81. Skulls of the Palaeolithic Races. 1, Neanderthal Man: Older Palaeolithic. 2, Crô-Magnon Man: Younger Palaeolithic.
(After Romer's *Vertebrate Palaeontology*)

generally suppressed, element in the make-up of the human race.

The characters of Neanderthal man are, unlike racial characters in general, easily appreciated without much knowledge of anatomy. The superciliary or eyebrow ridges were prominent, the forehead receding and the skull thick. The lower jaw was massive with a complete absence of 'chin.' The stature was low and the limbs were curved. The whole carriage of the body was probably less erect than in modern man.

On the other hand, Younger Palaeolithic man was essentially modern and hardly distinguishable in his skeletal remains from the races which inhabit the earth at the present day. It is difficult for any but a trained anthropologist to appreciate or discuss the characters that distinguish the modern races or to estimate the significance of similar characters in Aurignacian, Solutrean or Magdalenian man, but it is clear that he was extremely erect and active and endowed with no mean intellectual qualities.

In *Nature* of February 19th, 1938, Sir Arthur Keith gives a preliminary account of the evolved Neanderthaloid skeletons found by Miss Dorothy Garrod and Mr. T. D. McCown in the Mousterian strata of Palestine. The men of this race were considerably taller and more erect than the Neanderthals of Europe, ranging in height from 5 ft. 8 in. to 5 ft. 11 in. They were giants in those days, but the women on the other hand were of short stature, varying from 5 ft. to 5 ft. 4 in. They had straight and strong limbs and ample chests and were apparently runners and long-winded. Their brains were equal to those of modern man in capacity, but simpler in their convolutionary pattern. All parts of the brain which indicate a capacity for speech are present, and the muscles of the tongue were attached as ours are. Nevertheless, they were primitive in many respects. They had the Neanderthaloid eyebrow ridges, large mouths and thick and strong necks.

In some characters they displayed extraordinary variation. 'Chins were at every stage of evolution—from a chinless stage, comparable to that of the chimpanzee, to chins of modern development.' Noses varied from the Roman to the Negroid type. Sir Arthur Keith 'found it possible to arrange the individuals of the group in a

series; at one end a woman had her closest affinities to the very primitive Neanderthal type of Europe; at the other end of the series was a man who might be a crude form of early European.' To him this seems a plastic folk in the throes of evolutionary change. True, but does not the extraordinary mixture and variability indicate crossing between the Crô-Magnons and Neanderthals and perhaps other races?

Sir Arthur Keith points out that the Neanderthal skeletons found in Europe approximate more and more to the Palestinian type as one goes east, and he and Mr. McCown believe that further east in Asia will be found the fossil remains of Mousterian men of even more modern type.

BURIAL CUSTOMS

The customs accompanying the burial of the dead in Late Palaeolithic times present, according to Obermaier, a wide variety of development. The custom of encasing the body in ochre seems to have been fairly common. Sometimes only the head is treated. Graves were dug in some cases, and in others the bodies were covered over with stones to prevent the depredations of animals. Sometimes the bodies lie extended and at other times in a crouching position. Occasionally the hearth was used as a burial place, the body being placed directly on the ashes. The custom of depositing with the body ornaments, weapons and tools shows a belief in the continuance of life after death. Women and children are shown equal respect with men. Some of the bodies are in such a constricted position as to necessitate the conclusion that they were bound before burial. Among primitive living races a similar practice is indulged in in the belief that it prevents the return of the spirits of the dead.

Offerings were occasionally deposited in trenches beside the body. Thus, in the case of the so-called 'Red Lady of Paviland' in South Wales, the body, which was really that of a man, was found embedded in ochre and at the side was the complete head of a mammoth with tusks. It is clear from these and numerous other instances that Late Palaeolithic man had very definite religious instincts and beliefs.

One would, however, expect in these ancestors of modern man, who were in no way inferior to us physically or even mentally, as witness their astute observation and skill in drawing and sculpture, some traces of an early religion. It is more interesting to find that Neanderthal man had similar if cruder customs. The sepulture of a youth described by Hauser at Le Moustier is a case in point. The body lay in the attitude of sleep, with its head resting on a pillow-like mound of small fragments of flint, a hand-axe and scraper near its left hand.

The Mousterian burials of La Ferrassie, Dordogne, 5 km. west of Les Eyzies, were investigated by Peyrony with exceptional care. Here, in the Mousterian layer, beneath the whole succession of Aurignacian strata, were remains of six Neanderthaloid skeletons. All had been buried. Obermaier refers to it as a 'family sepulture.' The man lay east-and-west in the position of sleep, the head and shoulders surrounded and protected by slabs of stone. As certain parts of the remainder of the body were missing, it was apparently less protected. The woman lay also in the east-and-west line, but in the inverse position, with her head to the man's, the arms folded on the breast and the legs pressed against the trunk as if bound before burial. The children were interred in shallow trenches all with an east-and-west orientation. There were nine tiny hillocks, under one of

which was found the skeleton of a very young child. Three beautiful flint implements of Mousterian technique had been carefully placed in an east-and-west direction above the body. The hillocks were composed of the material of the Mousterian layer and, according to Peyrony, had been raised at the time of the burial.

The sixth skeleton, also of a child, lay in a hollow in the sloping floor on the east side of the shelter. The burial was in this instance covered by a slab of stone with thirteen cupules, one large and twelve small, in pairs, on the under side. The skeleton lay as usual east-and-west, the skull apart from the rest. Three beautiful flint implements, one point and two scrapers, had been placed over the bones.

Peyrony justifiably sees in these dispositions the signs of an elaborate ritual of burial, which is none the less obvious because its meaning partially escapes us. Some of the rites have been used in later periods, such as the east-and-west orientation, the use of cupuled or pitted stone, and the interment with the body of articles of use in life. This latter implies a belief in survival, in the immortality of the soul. There is little wonder that religious instincts are so deeply engrained in us. Even Neanderthal man had them.

CHAPTER XVII

LATE PALAEOLITHIC ART

THE first art is entirely a product of the Late Palaeolithic. The Mousterians and Acheulians show no trace of it. Its presence is, however, a character of all Late Palaeolithic races. Even the Solutreans, hitherto regarded as a relatively uncultured race of invading barbarians, are shown by Henri Martin to have been no mean sculptors.

Much of the skill of the Aurignacians and Magdalenians was applied to what we would call 'pure art,' sculpture and painting, though it is doubtful if 'Art for Art's sake' was their motto. It was much more likely based on magic or superstition. Indeed, in view of the fact that many of the most wonderful of their pictures are on the walls of the innermost recesses of caves, where the light of day never penetrates, it is clear that they were not drawn in order to be admired. They appear, as Obermaier puts it, to have been meant for the eyes of the gods alone. Possibly by some process of 'sympathetic magic' the artist who depicted the animal hoped that the spirits, with which his imagination peopled these remote caverns, might bring him luck in the chase.

This concealment of their art was, however, not universal or world-wide. It was, as far as at present known, confined to the Franco-Cantabrian region—that is to say, France and the portion of Spain north of the Cantabrian Mountains. The very different and not necessarily contemporaneous people of eastern Spain drew in the light of day and their friezes are found in open



PLATE VIII



Painting on the Walls of the Rock-shelter of Cogul, Lérida (after J. Cabré). (From Obermaier's *Fossil Man in Spain*)
About $\frac{1}{12}$ natural size

shelters, as indeed were the sculptures of the Solutreans at Le Roc, described by Martin. The frieze of the Bambata Cave in Rhodesia was also in the open.

The engravings and paintings of the Franco-Cantabrian region are essentially naturalistic in their treatment. The distinctive peculiarities of the animals are minutely observed, and depicted with the greatest care, so that they can be readily identified. Naturally, there is much variation in skill, and the artist occasionally makes several attempts at a line before it pleases him. In places,



Fig. 82. Cave Bear engraved on the rock of the cave of Combarelles, Dordogne, France. (After Breuil)

Greatly reduced in size

probably owing to lack of space, the drawings and paintings are placed one over the other so as to produce an almost undecipherable palimpsest. Most interesting of all is the adaptation of the drawing or painting so as to make some natural boss or line of the wall fit into the form of the animal, as can be admirably seen in the North Spanish cave of Altamira.

The age of these drawings is determined in various ways. Superposition is an obvious clue. Of two drawings, that which covers the other must be the later, but it need not be very much later. Difference of

pigment augurs greater separation in time, and occasionally fragments of the pigments are found in the strata of the cave with tools indicating their archaeological age. It is not often that it is given to an archaeologist to make the beautiful observation of Leslie Armstrong in Bambata Cave, where superimposed drawings in three types of ochre were exactly dated by the discovery of the three ochres in the same order of superposition in the cave deposits.

Occasionally, where the deposits of a cave are stripped

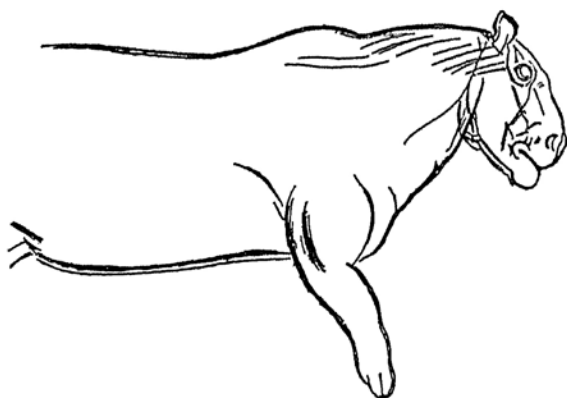


Fig. 83. Cave Lion engraved on the rock of the cave of Combarelles, Dordogne, France. (After Breuil)
Greatly reduced in size

away, they expose paintings, engravings or sculpture which must of necessity be older than them. Burkitt cites several cases where such discoveries were made. At Cap Blanc, in the Beune Valley, about 5 m. from Les Eyzies, when the strata, which proved to be entirely Lower Magdalenian, were removed, they revealed a frieze of horses, bison and oxen, which were thus older than the bulk of the debris of the Lower Magdalenians, and, since the cave yielded no other culture, must be presumed to have been executed by these people themselves. At

La Grèze, also in the Beune Valley, strata of Magdalenian and Solutrean age covered an engraving of a bison. This must therefore be older than the Solutrean and is, on style alone, considered to be Aurignacian. In the cave of Pair-non-Pair, near Bourg-sur-Gironde, were deposits of Upper, Middle and Lower Aurignacian and Mousterian

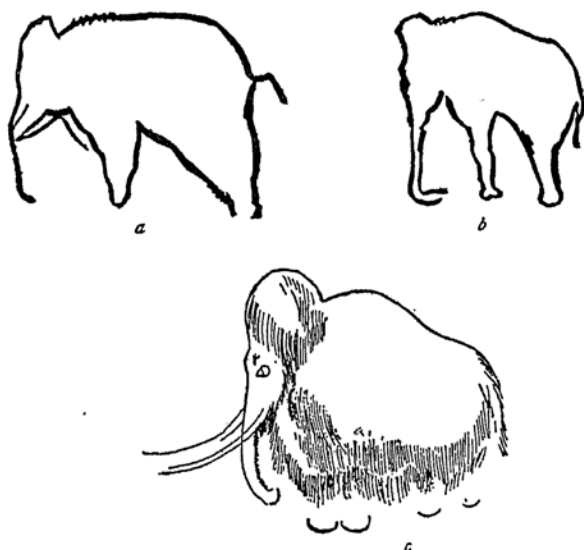


Fig. 84. Elephants of the Glacial Epoch. *a, b*, Hairless elephants painted in red on rock in the caves of Castillo, Santander and of Pindal, Asturias, both in Spain. *c*, Mammoth engraved on rock in the cave of Font-de-Gaume, Dordogne, France. (After Breuil)

Greatly reduced in size

ages, and on the walls were engravings which were covered by Upper Aurignacian strata and must thus be older than the latter. In no case have any Mousterian strata ever been found to cover a cave drawing. Neanderthal man was evidently no artist.

Among the animals recognisably depicted in these etchings and paintings of Aurignacian and Magdalenian ages in the various caves are the mammoth, reindeer,

rhinoceros, horse, bison, ox, stag, ibex, bear, lion, glutton, wolf, seal, salmon and (?) stork. Birds are exceptionally rare and not very well drawn. These animals are shown in all varieties of position—erect, grazing, lying down, wounded, the heads always in profile, but sometimes turned back, looking behind them. In exceptional cases



Fig. 85. A Battle of Archers. Rock painting in red from Morella la Vella, Castellon. (After E. Hernander-Pacheco)
(From Obermaier's *Fossil Man in Spain*)

an arrow is added pointing to the heart, a further indication that the drawings have some significance connected with hunting.

Human figures are rare in these northern drawings, and, where definitely human and not merely anthropoid, are always masked, sometimes with obvious animal

heads. The features of the anthropoid figures are always grotesque.

Quite different are the drawings in the rock-shelters of eastern Spain. The artists have here revelled in depicting

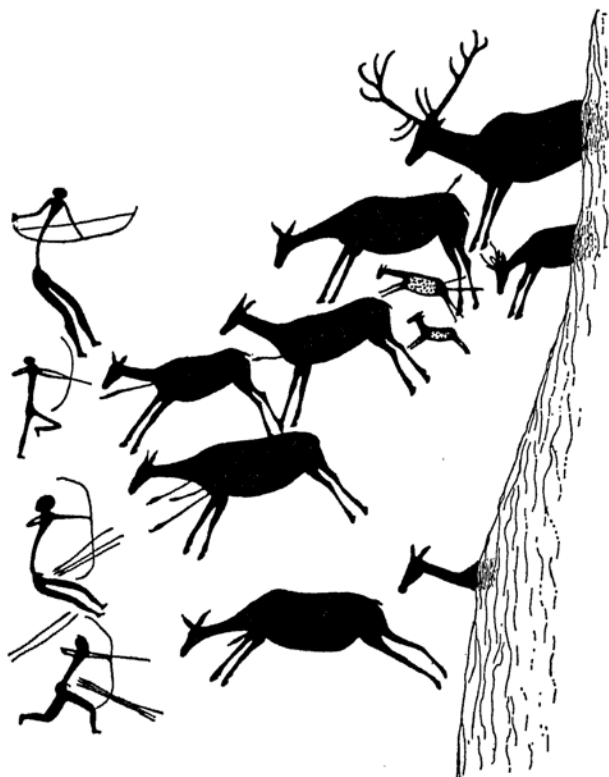


Fig. 86. The Stag Hunt. A mural painting in dark red (restored) in the Cueva de los Caballos, near Albocacer, Castellon. (After Obermaier)

Reduced in size

the human figure, more especially in action, running or drawing the bow. The pictures tell a story in a way that is never attempted in France or Cantabria. A battle may be represented (Fig. 85) or the chase (Fig. 86) or honey-gathering (Fig. 87). The figures of men are often

represented as unnaturally thin or lithe (nematomorphic), but the motion depicted in some of them is really marvellous. They are naked, but adorned with head-dresses, and frills on their arms, legs and waist (Fig. 88). On the other hand, the women are most modestly and becomingly



Fig. 87. Rock painting in red at the Cuevas de la Araña, Bicorp, representing a Gatherer of Wild Honey.

(After an original copy made by W. K., 1921)

Actual size

clad with long skirts to below the knee and conical bonnet or coiffure (Pl. VIII). The fauna depicted is noticeably poorer than that of the northern art. Ox, deer, moose, boar, goat, ibex, wild ass and wild horse are shown. The absence of mammoth, rhinoceros, reindeer, musk-ox, etc. is merely a matter of climate, but there must have been

some carnivores, yet they do not appear. The scenes are often markedly impressionistic in treatment, the artist freely ignoring detail and anatomical exactness in order to emphasise a certain action. Thus the battle depicted



Fig. 88. Men's Body Adornments shown in Palaeolithic Rock Paintings in the Province of Castellon. *a*, From the cave of Saltadora. A hunter with adornments on head, middle, and legs. *b*, From the Cueva del Mas d'en Josep. A hunter with adornments on the back, middle, and one knee. *c*, From the cave of Saltadora. A hunter with knee ornaments. *d*, From the Cueva del Mas d'en Josep. A hunter with adornments on head, middle and knees. (After H. Obermaier and P. Wernert)

Reduced in size

in Figure 88 is impossible when analysed in detail, yet it undoubtedly conveys the impression of strife.

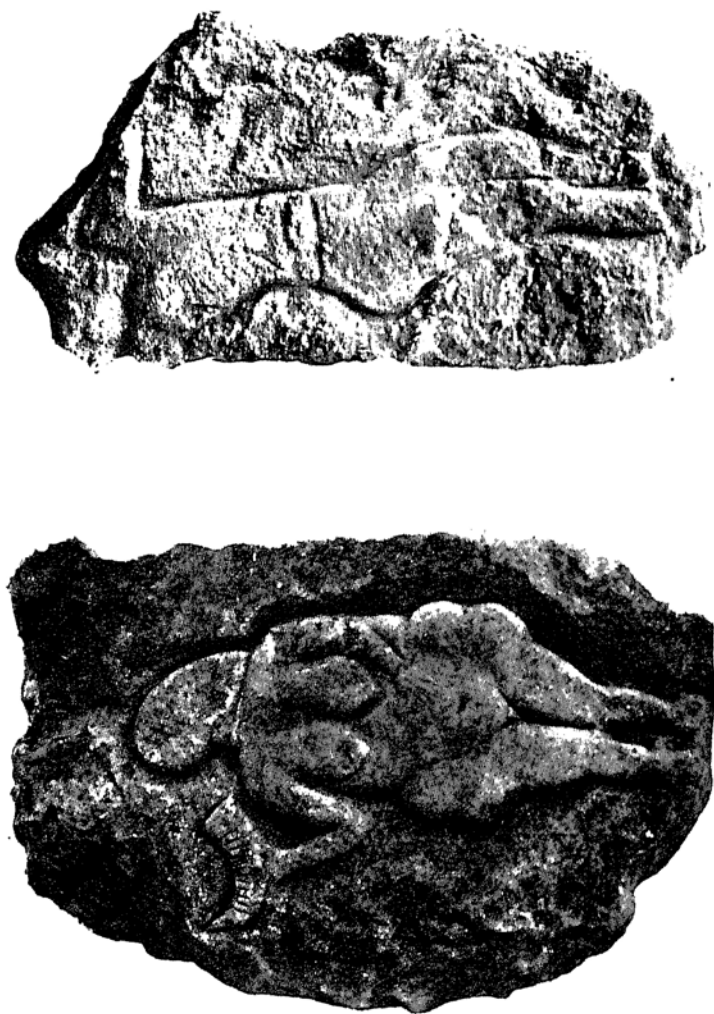
There is much controversy regarding the age of these eastern Spanish drawings. None of the rock-shelters in which they occur contain any implementiferous deposits at all. Nevertheless, Obermaier confidently regards

them as Late Palaeolithic. The style of the animal painting is somewhat similar to that of the north, and the Mesolithic cultures, Azilian and Tardenoisian, have their own stylised or diagrammatic art, which it is quite impossible to imagine having been executed by the same people.

These two types of pictorial art on the walls of caves and rock-shelters are very limited in distribution. Thus the northern Franco-Cantabrian type is more or less confined to the district surrounding Les Eyzies in the Dordogne, the northern slopes of the Pyrenees and the northern slopes of the Cantabrian Mountains. Outlying examples of a rather crude type are not unknown, as, for example, the cave of Romanelli in Italy, and there may be cases in other regions not yet discovered. The actual distribution of caves is, of course, itself very limited. The East Spanish art also is definitely confined to the Mediterranean coast of Spain, and, according to Burkitt, never penetrates very far inland.

On the other hand, decorative art on objects of utility found in the strata of the caves has a much wider distribution, and ranges from Russia, on the one hand, to Great Britain, on the other. Among the objects of this *art mobilier* are a number of statuettes and bas-relief carvings, mainly female, which archaeologists refer to as Venuses, e.g. the Venus of Kostenski (Russia), the Venus of Willendorf (Austria) and the Venus of Brassempouy (France), although the title is rather a libel on their prototype. Still, there is no accounting for tastes, and the author has to confess that the Venus of Milo never appealed over much to him. Male figurines are rare, but, at Laussel in the Dordogne, were two bas-reliefs, one of a woman holding a bison's horn, and the other (incomplete) of a man apparently in the art of drawing a

PLATE IX



Figures in Bas-relief from Laussel in the Dordogne. (From Obermaier's *Fossil Man in Spain*)

bow (Pl. IX). The bow and arrow do not appear in the picture as preserved, but the former might have been represented. The treatment is naturalistic and the proportions of the figure well preserved, there is no exaggerated slimness, as in the drawings of East Spain, but this, of course, is sculpture, not painting. The Venus of Brassempouy is merely the head of a young woman, but shows either an elaborate head-covering or neatly dressed

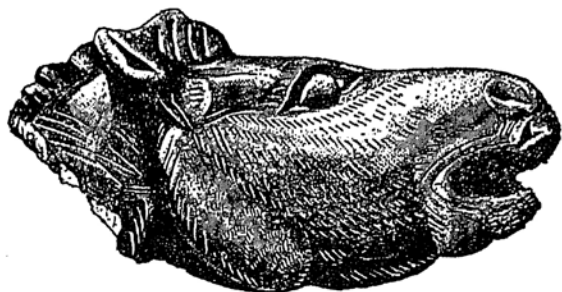


Fig. 89. Head of a Horse, neighing, carved in reindeer horn, from the cavern of Mas d'Azil. (After E. Piette)

Actual size

hair. All these figures and carvings are of Aurignacian age.

Some of the solid carvings of animals show very considerable artistic skill. Thus the head of a neighing horse carved in ivory from Mas d'Azil (Pyrenees) is marvellously realistic, and the well-known adaptation of the goat and reindeer to the throwing-stick and dagger handle display exceptional cleverness. (See Fig. 29).

Etchings on ivory and bone are naturally more common than carvings, since they take a much shorter time in execution. Among these are two famous pieces, the grazing reindeer and the mammoth (Figs. 90, 91), the latter of which gave Science its first idea of the hairiness of this animal. A similar impression is obtained from the cave drawing shown in Fig. 84 from Font de Gaume,

Les Eyzies. The young mammoths portrayed in some of the caves are depicted as mere balls of wool.

But perhaps the most curious and interesting phase of Late Palaeolithic art is the modelling in clay. The finest examples of this were discovered by Count Bégouen in the cave of Tuc d'Audoubert, Ariège, which can only be entered by boat, as a subterranean river flows along it for

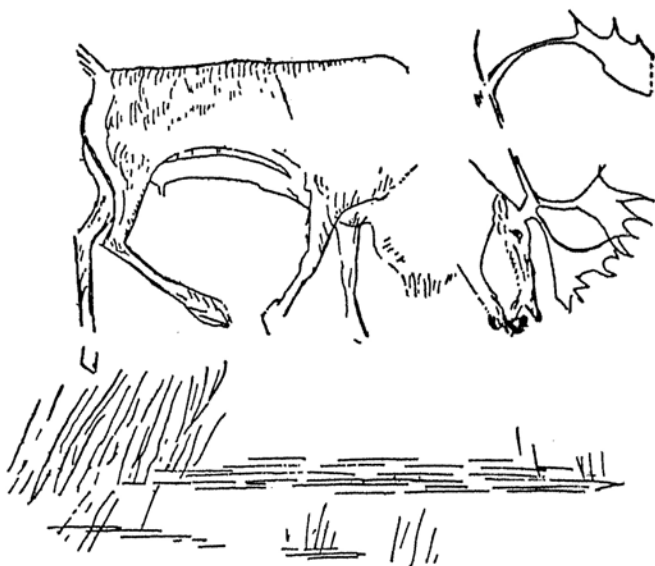


Fig. 90. The Grazing Reindeer from the Kesslerloch, near Thayngen, Switzerland, Engraved on a Shaft Straightener.
(After Merck)

Original size

a distance of 80 yards. Thence an upward scramble leads to a larger and beautiful stalactitic chamber, with engravings in one corner of horse, reindeer and bison. By a chimney leading from this chamber, and a narrow passage only traversed by lying flat and crawling, access is had to the interior of the cave, which was sealed up by stalagmite when first discovered. The inner chambers are damp and their floors are mud-covered. In the mud

are impressions of feet and, further in, of heels only. Here are two bison modelled in clay and several uncompleted examples. The modelling is beautifully done and close by is the hole from which the artist extracted his modelling clay. The rest of the chamber has not been explored, because it would be impossible, without the aid of scaffolding, to penetrate further without injuring the modelling. (Burkitt, 1921.)

Very little art is known from the caves of England.



Fig. 91. Mammoth engraved on ivory from La Madeleine.
(After Lartet and Christy)

Scale, $\frac{1}{2}$

Some horses' heads from Creswell Caves, discovered by Boyd Dawkins, have long been known, and Mr. A. Leslie Armstrong has recently discovered in Pin Hole Cave, Creswell, an engraving on bone of a masked man.

The art of the Postglacial Azilians hardly bears comparison with that of Late Palaeolithic man. It is conventional and childish in style, but nevertheless interesting, since it gives, according to Obermaier, an explanation of the curious painted pebbles.

CHAPTER XVIII

CONCLUSION

IN the European Stone Age succession from Eolithic to Neolithic there seems to be little or no discontinuity, although there are several abrupt changes, as, for instance, the incoming of the Younger Palaeolithic, and within this latter the invasion of the Middle Aurignacians and Solutreans. Again, the Proto-Neolithic races were apparently a new stock, and here it is not quite clear whether they entered a country depleted of its population or found there some descendants of Palaeolithic man. They almost certainly never came in contact with Magdalenian man. The only demonstrable passage from the Younger Palaeolithic to the Proto-Neolithic is via the Tardenoisian, which, there is every reason to believe, grew out of the Aurignacian and Mousterian of Africa, and entered Europe via the peninsula of Spain.

The Older Palaeolithic industries seem to have had a very wide distribution and great uniformity throughout their area. Their possessors possibly led a family life as isolated as that of most beasts of prey, but of this we know little. Younger Palaeolithic men probably were the first to be truly gregarious and gather together into tribes and races.

Breuil's great conception of two Older Palaeolithic stocks, a northern and eastern, making only flake tools and a southern and western with the hand-axe, has, of course, only a local application. It obviously, for instance, does not apply to Africa. In north-western Europe,

however, it appears to be of great significance, and may well lead to the unravelling of the glacial tangle. In England, France and Belgium we may expect the flake industries, Clactonian, Levalloisian and Mousterian to be associated with the glaciations, and the *coup-de-poing* industries, the Chellean, Acheulian and Micoquian to mark the Interglacial periods.

For many years past it has been maintained by geologists, not only on *a priori* grounds, but also from geological evidence mainly derived from the last ice age, that glaciation means low ocean-level. Breuil's proof that the Levalloisian and Younger Palaeolithic solifluxions descend into the buried valley of the Somme, and the Clactonian solifluxion to at least the 10-m. level, comes as a welcome confirmation. In littoral regions we must expect raised beaches and river-terraces only in the Interglacial periods. The glacial beaches are all below sea-level, and the glacial river terraces are deep in the buried valleys. We are left with the problem of how to assign the sparsely preserved remnants of marine shorelines to their appropriate Interglacials. We may, I think, presume that within limits¹ they will remain horizontal, since we know one at least which maintains its approximate horizontality for great distances. If, therefore, a sea-level is dated in one place, we may fairly assume it is dated in all. This presumption was made in the tentative correlation of Chapter XII, where the 100-ft. level of Clactonian and Acheulian times in the Somme and Thames was projected north to Kirmington and the Vale of York and west into the Severn, thus dating the immediately following glaciations as Levalloisian.

¹ The exceptions are, of course, those areas affected by residual depression under the ice and also those affected by Quaternary folding or warping.

It is very important to remember, however, that the sea-level in the Clactonian-Acheulian Interglacial was by no means constant. It ranged in the Somme, from 45 m. down to 10 m. at least, leaving, however, its best-marked terrace at 30 m. We, unfortunately, do not know very much about levels in the other Interglacials. The 10-m. terrace in the Somme was occupied by the river after as well as before the Levalloisian solifluxion, and the same appears to have happened on the so-called 50-ft. terrace of the Thames. The levels are not very accurately defined, but would seem to call for a raised shoreline at about 40 ft. There are on the coasts of Britain obscure traces of a shoreline at this height, e.g. on the Hoe at Plymouth and at the Thatcher Rock and Hope's Nose, Torbay, in Devonshire, where their faunas have been studied by A. R. Hunt. If correlated thus, they would be Riss-Würm in age.

This would account for the sea-levels of the second and third Interglacials—in the Alpine terminology, Mindel-Riss and Riss-Würm. Of that of the first we have as yet no indication.

It is interesting, in view of the similarity of the Nile terraces to those of the Thames, to consider whether these stages can be traced in the Mediterranean. Many of the shores of this sea have been subjected to later *progenic* movement, and the terraces are found at considerable altitudes. Much of the west and south, however, appears to have been stable, and in this area Depéret has given names to a number of marine transgressions of Pliocene and Pleistocene times. These are:

	ft.
Sicilian	330-295
Milazzian	195-180
Tyrrhenian	115-100
Monasterian	65-60

Only the Tyrrhenian and Monasterian concern us here, since man makes his first known appearance in the Mediterranean in Tyrrhenian times. Reference to Chapter XIII will show that, when the Nile ran 100 ft. above its present level, the country was occupied by Acheulian and Clactonian man, and these industries were continued at the 50-ft. level, as they were in the Somme. The 100-ft. terrace probably corresponds to the Tyrrhenian level. The later lower or 50-ft. terrace may or may not be the Monasterian of Depéret, the facts regarding the levels of which do not seem to be at all clear, or, as is more likely, the latter may be the 30-ft. terrace of the Nile. A. C. Blanc points out (1936) that the term 'Tyrrhenian,' originated by Issel, includes in its original significance all deposits of the warm *Strombus* sea from 100 ft. downwards, and, once thus defined, should be left with its original faunal meaning. Blanc then proceeds to demonstrate that there was a very marked post-Tyrrhenian depression of the surface of the Mediterranean to 100 m. or more below its present level. His evidence for this is as follows:

- (1) A submarine platform along the coasts of the Mediterranean at -100 m. shown by soundings.
- (2) The submerged delta of the River Po in the Adriatic with its edge at -100 to -110 m. (The really steep slope of the frontal face begins at -150 m.)
- (3) The occurrence of this submarine platform at approximately -100 m. around the Rock of Gibraltar, and the necessity of its exposure at a time when the Æolian deposits of the Devil's Tower Cave were formed. These deposits rest on a marine shoreline at 12 m. over the sea and contain Mousterian deposits with *Homo neanderthalensis* (Garrod, 1928).
- (4) The fact that the emergence of a littoral platform has been demanded by Boule to explain the presence of the great pachyderms in the caves of Grimaldi in Mousterian times, and that a

similar claim has been made by G. A. Blanc for the Romanelli Cave, Otranto.

- (5) The fact that Quaternary dunes, sometimes containing remains of Mousterian man, occur in positions where their accumulation would be impossible without the exposure of a foreshore now submerged.

This period of low sea-level is assumed by A. C. Blanc to be followed by the Flandrian transgression, well known for north-western Europe, but almost unknown in the Mediterranean until he carried out his remarkable

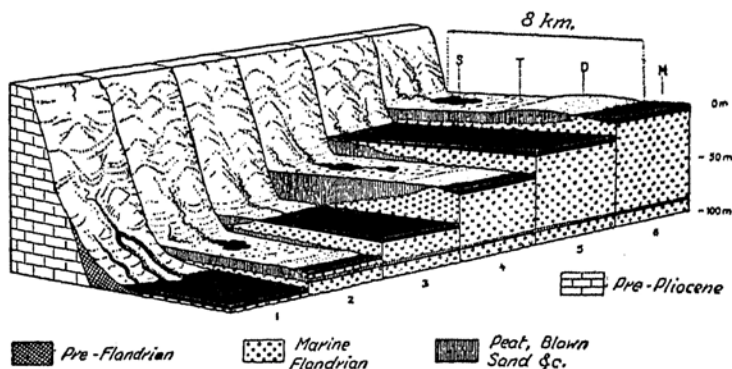


Fig. 91. Stereogram showing the Formation of the Coastal Plain of Versilia N. of Pisa. (After A. C. Blanc)

researches in the Italian marshes. This Flandrian transgression is conceived as beginning after the maximum of the last glaciation and ending or possibly continuing at the present day. The worked flints obtained from these deposits by pumping the sand are evolved Mousterian and Lower and Upper Aurignacian. These come from the dune sands down to -12 m. The beds laid down during the transgression are, however, known by borings down to -92 m. In its course there were three periods during which a sand-bar was formed, behind which marshy and peaty deposits accumulated. The uppermost of these sand-bars is that from which

the evolved Mousterian and Aurignacian implements were obtained by dredging. The lower two-thirds of the transgression must therefore have been Mousterian or pre-Mousterian, and it is noteworthy that the middle stage of marsh and peat deposits at about -40 m., more or less, contains a pine flora (*P. mugo*, *P. silvestris*, *Picea*, *Abies* and *Betula*) and thus indicates a cold climate, while the marine beds above and below yield *Vitis* (the vine). Blanc, however, considers the whole series of sediments from -92 upwards as Flandrian, and emphasises the fact that they contain no form which does not inhabit the adjoining seas at the present day, being thus quite distinct from the Tyrrhenian with its *Strombus* fauna.

This succession is, of course, far too simple for the theory of low glacial and high Interglacial sea-level, for, as we have seen above, the Tyrrhenian is Acheulian-Clactonian Interglacial, or, to boldly use the Alpine terminology, Mindel-Riss, and we would expect a Micoquian (or Levalloisian) Interglacial (Riss-Würm) to follow, corresponding to the 40-ft. level in north-western Europe. This may be Depéret's Monasterian and the 12-m. level at Gibraltar, and these may both be conceived of as prior to Blanc's Flandrian. However, this is one of those delightful unsolved problems for the solution of which we must look to the future. One thing I think is clear, and that is that the so-called Preglacial raised beach of Britain and France, at 10-15 ft. above sea-level, is not Monasterian, as Depéret supposed, for it is prior to the older drift of England, and therefore prior to the Tyrrhenian. But why are the later Interglacial shorelines so relatively poorly preserved?

The presence of terraces of Mousterian age at 10-25 ft. in the Nile Valley ought to have a distinct bearing on

the question. To Sandford they are merely stages of recession from the 100-ft. and 50-ft. levels of the river, but he admits that they are terraces of aggradation, i.e. due to a rise of small amount in the river-level. He has no pre-Mousterian period of really Low Nile level comparable to that which followed the Mousterian period. In this latter he puts all the deep erosion of the Faiyum, to depths of 147 ft. below sea-level. He has thus taken up independently the same position as Blanc, and sees only one period of low sea-level between the Tyrrhenian and the present. Is it not possible to have independent periods of low sea-level for the Riss and Würm Ice Ages, coming respectively before and after the Mousterian terraces of the Nile and before and after the Monasterian or 40-ft. shoreline.

To plead for such reinterpretation of the facts a few years ago would have been illogical in the extreme, but now we have Breuil's correlation to work from; and a Monasterian interruption of the post-Tyrrhenian and pre-Flandrian period of emergence seems called for. The present depth of the Faiyum may be due to the last ice age, but surely the hollow in which lay the 112-ft. lake of Mousterian age must have been formed during the denudation of the preceding one, and for such wide denudation some depth of cutting is demanded.

Moreover, Penck's observations on the snow-line of the Riss Ice Age in the Alps give indirect evidence on the level of the Mediterranean. He has called attention to the fact that the present snow-line descends towards the northern Adriatic on account of the greater precipitation in the neighbourhood of the latter, that the calculated snow-line of the Würm Ice Age does likewise, but that of the Riss Ice Age does not. He concludes, therefore, that the Adriatic was either absent or much more distant

during the Riss. The obvious corollary is an extremely low sea-level, much lower than that of the Würm.

The cave deposits of the Mediterranean Islands have a distinct bearing on the problem. They have been investigated by Vaufray with a view to proving or disproving an isthmus connecting Europe with Africa in Quaternary times. He finds that all the caves have two deposits: an older without human remains, but with bones and teeth of dwarfed types of *Rhinoceros* and *Elephas antiquus* (the European Interglacial elephant), and an upper with implements of Late Palaeolithic man and a limited fauna of ass, deer and boar. Thus, when Late Palaeolithic man reached the islands, they were islands, and he is consequently only accompanied by such animals as he could bring with him in boats. Before this, however, was a period, first of connection with the continent to permit the entry of elephant and rhinoceros, and then of insularity to allow of the development of dwarf forms. Moreover, the connection with the continent was more complete than in Würmian or Late Palaeolithic times, and implies a lower level of the Mediterranean in Riss or earlier times.

Indeed, the writer has put forward speculations regarding the possibility that, in the Riss Ice Age, the ocean-level fell below the sill of the Straits of Gibraltar, and left the Mediterranean as a basin of interior drainage with two lakes, an eastern fresh-water lake draining into a salt lake in the west. Such a state of affairs would explain the enormous abundance of hippopotamus remains in the Palermo caves. Moreover, the catastrophic return of the ocean water to fill the basin would account for the great submarine gorge which begins west of the Straits and runs through them down into the western deep of the Mediterranean. It would also

provide more effective conditions for the trapping in the islands of the great pachyderms. Mousterian man must have been in occupation of the less desert parts of the basin, but his superior intelligence would warn him not to take refuge from the rising flood on what must at that time have been rather inhospitable mountain-tops. It is, of course, all guess work, but what a picture and, as has been pointed out, not entirely without foundation.

We have been discussing what may have happened in areas of crustal stability, where the world-wide displacement of ocean-level has left its record in beaches which appear from their scattered remnants to be approximately horizontal over great areas. We have in the north other areas in which there are marine shorelines which are highly tilted. These shorelines, which are Late Glacial and Postglacial, are, in fact, warped into domes round about the glacial centres where the ice was thickest. Moreover, the Preglacial and Interglacial shorelines penetrate horizontally into the areas of warping. The tilted shorelines were therefore cut when the land was temporarily depressed by the ice-load and during its recovery. In Chapter IX a new point is made with regard to the latest of these shorelines, which were everywhere the haunt of Proto-Neolithic and Early Neolithic man—namely that the maximum of submergence which produced the shoreline was earlier in the central than in the peripheral areas, so that the shoreline cannot be taken as a chronological datum-line.

We have now dealt with the record left by early man in the continents of Europe and Africa. He had, of course, a wider distribution, but it is difficult as yet to weave our fragmentary knowledge of other countries into a connected whole. In Europe and Africa the Lower and Upper Palaeolithic were demonstrably the products

of distinct species, but we do not know of the earlier race in connection with any implements older than the Mousterian or Levalloisian. Late Palaeolithic man was obviously an invader, probably from Asia, whence he came in successive waves, each carrying a new culture, Lower and Middle Aurignacian, Solutrean and possibly also Magdalenian.]

Of the truly Mesolithic races, Azilian and Tardenoisian, the Tardenoisians almost undoubtedly entered from Africa via Spain and possibly also via Palestine. Their industry was probably a local development of the African Capsian. The Azilians have a western distribution in Europe, but their origin is unknown. The Proto-Neolithic and Neolithic races are again supposed to have come from the east. They were certainly new arrivals in Postglacial times, and came on the scene with a completely novel and fully developed culture.

A GLOSSARY OF TERMS

(For references to tool descriptions see Index)

- AGGRADATION.** The building up of river or sea deposits by rise of water-level. A terrace of aggradation is thus distinguished from a terrace of erosion by the thickness of its deposits.
- ANCYLUS LAKE.** The fresh-water stage of the Baltic inaugurated when a dropping sea-level left it without connection with the ocean.
- ATLANTIC PERIOD.** The second epoch of Postglacial time, when mixed oak forest was the dominant vegetation in north-western Europe.
- BALTIC ICE LAKES.** Lakes held up in the southern Baltic by the ice during its retreat.
- BOREAL PERIOD.** The first epoch of Postglacial time when pine forests were dominant in north-western Europe.
- BOULDER CLAY.** Clay with scratched stones and erratics. Ground-moraine of the ice-sheet.
- BÜHL-STADIUM.** The first stage in the retreat of the Alpine glaciers.
- CANNON-SHOT GRAVELS.** Gravels mainly composed of rounded flints.
- CLIMATIC OPTIMUM.** The period at the end of the Boreal and beginning of the Atlantic when the mean annual temperature in north-western Europe was higher than that of the present day.
- COOMBE ROCK.** Rubble filling the hollows on the chalk uplands.
A type of solifluxion deposit.
- Corbicula fluminalis.*** A small warmth-loving bivalve inhabiting the Nile and other rivers of the Near East.
- CRAG.** Shelly sands of Pliocene age beneath the drifts of East Anglia.
- CROMER FOREST BED.** An estuarine deposit above the Pliocene crags of Norfolk.
- CROMER RIDGE.** A ridge of sand, gravel and boulder clay which caps the northern cliffs of Norfolk.

- DANIGLACIAL.** The period during which the ice retreated from the Danish end-moraines to the south of Sweden.
- DILUVIUM OR DRIFT.** The glacial deposits, at one time ascribed to the Flood.
- FINIGLACIAL.** The period during which the ice retreated from the Swedish end-moraines to Ragunda, where its last remnants split in two.
- GLACIAL ANTICYCLONE.** All ice-sheets owing to their chilling effect on the air have radially directed (anticyclonic) winds.
- GOTIGLACIAL.** The period during which the ice retreated from the south of Sweden, to the Swedish end-moraine or Salpaussellkä.
- GROUND MORaine.** Boulder clay deposited beneath the ice-sheet.
- ILFORD MAMMOTH.** *Elephas trogontherii*.
- INTRUSIVE.** Typologically discontinuous with the strata above and below.
- ISOSTATIC RECOVERY.** The rising of the depressed crust of the earth after removal of the ice load.
- ISOSTATIC REGIONS.** Regions showing in their tilted shorelines the effects of isostatic recovery.
- LAMINATED CLAY.** Clay showing laminae or varves.
- LITTORINA SEA.** The Postglacial transgression of the Baltic which followed its occupation by the Ancylus Lake. The oceanic Littorina stage of the coast of Norway was not contemporaneous with the Littorina Sea of the Baltic, but with the earlier Ancylus Lake.
- LITTORINA-TAPES SHORELINE.** The shoreline of the maximum Postglacial submergence in the peripheral regions of Scandinavia, and the equivalent shoreline in the central regions. *See* Littorina Sea.
- LOESS.** Wind-borne dust, anchored by grass. Usually calcareous. Characterised by vertical cleavage.
- LOESS LOAM.** Weathered loess, non-calcareous.
- MIDDLE PALAEOLITHIC.** Levalloisian and Mousterian, now generally included in the Older Palaeolithic.
- Neanderthalensis.** The specific name applied to Levalloisian or Mousterian man. The termination *ensis* is usually employed to convert a place-name into the trivial name of a species.

- OLDER DRIFT.** The much-denuded glacial accumulations of the south.
- OROGENIC MOVEMENT.** Movement of the earth's crust, giving rise to mountains. Irreversible, and thus quite distinct from isostatic movement.
- PATINATION.** The change induced in the surface of flint by weathering.
- Periglacial.** Peripheral to the Glaciation. A term applied to the effects of glacial periods in unglaciated regions.
- PIEDMONT GLACIER.** A valley glacier which expands on to a plain.
- PLEISTOCENE.** Defined either by mammals or marine mollusca. The presence of *Elephas* and *Equus* is supposed to distinguish it from the Pliocene.
- PLIOCENE.** A subdivision of the Tertiary in the sequence: Eocene, Oligocene, Miocene, Pliocene, Pleistocene, Holocene. Defined either by mollusca or mammals. The mastodon is the characteristic Proboscidian.
- POLLEN ANALYSIS.** A count of pollen-grains by which is effected the sub-divisions of the Postglacial Period into Boreal, Atlantic, Sub-boreal and Sub-atlantic. Equality of pine and alder percentages marks the passage from Boreal to Atlantic.
- QUATERNARY.** A subdivision of geological time in the sequence: Primary, Secondary, Tertiary, Quaternary. Embraces the Pleistocene and Holocene. Commonly regarded as beginning and ending with the Ice Ages.
- Sensu stricto.** In the restricted sense. **Sensu lato.** In the broad sense. Abbreviations *s.s.* and *s.l.*
- SOLIFLUXION.** Soil-creep under glacial conditions; usually recognised by contortion and verticality of pebbles. See p. 87.
- STEPPE.** The semi-arid regions with dominantly annual vegetation, where loess accumulates.
- SUDD.** A swamp on the Upper Nile.
- TAIGA.** The coniferous forest of North Asia.
- THALWEG.** Profile of the course of a river.
- TRAIL.** Festooned or contorted gravels. A type of solifluxion.
- TRANSGRESSION.** Invasion of the land by the sea.
- TUFA.** Lime deposited by springs.

TUNDRA. The permanently frozen ground of the north.

TYPOLGY. The study and classification of implements by their form and function.

VARVES OR VARVED CLAYS. Annually laminated glacial clays.

WADI. Dried up river valley with or without periodic floods.

WEALD. An area in Kent where the crest of a chalk anticline has been denuded away, exposing the softer strata beneath. It is flanked by the North and South Downs or chalk uplands.

WOOD TECHNIQUE. More delicate flaking, supposed to have been done with a wooden block instead of a stone.

YOLDIA SEA. The sea which invaded the depressed Baltic lands in Late Glacial times.

YOUNGER DRIFT. The practically undenuded drift of the North German Plain, with many unsilted lakes. In England something definitely older.

ZONES. Stratigraphical horizons characterised by one or more fossils.

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